FORESTRY ABSTRACTS

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EDITORIAL NOTE

THE Notes introducing Vol. 13 (1) included an improved system of transliteration for Cyrillic and a transliteration system for Greek. Since forestry literature from Persia is now being dealt with, an appropriate system of transliterating Arabic, Persian and Urdu characters is called for and it has been decided to follow the system approved by the Council of the Royal Asiatic Society, London, with one minor amendment. The transliterations adopted from the alternatives offered in that system are shown below:—

	Arab.	*Per.*	*Urdu*		*Arab.*	*Per.*	*Urdu*
ث	th	s̲	s̲	ط	t̲	t̲	t̲
ج	j	j	j	ظ	z̲	z̲	z̲
خ	kh	kh	kh	ع	gh	gh	gh
چ	—	ch	ch	و	w	w	w
ذ	dh	z*	z*	ی	ai	ai	ai
ژ	—	zh	zh	ؤ	au	au	au
ش	sh	sh	sh	ہ	h̲	h̲	h̲
ض	ḍ	z̲	z̲	ھ	, imperceptible, will NOT be transliterated		
				ء	(hamza) '	'	'

* adopted in place of z̲ which signifies ظ

RECENT DEVELOPMENTS IN THE DESIGN AND USE OF EUROPEAN GRAVITY CABLEWAYS FOR THE EXTRACTION OF FOREST PRODUCE

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THE use of cables for transporting timber has a long history; already in the 4th century the Chinese were conveying firewood across wide rivers and ravines by a system of wire ropes. Records exist of timber extraction by cables from Central European forests over a period of more than five hundred years, and an old engraving of 1776 shows that a very elaborate cable system was at that time in use in the Pyrenees for extracting timber in long lengths to meet the needs of the French naval dockyards.

During the 1914–18 war, cableways were used extensively on the Austrian–Italian front, which was stabilized for a long period in difficult Alpine country. Guns were hauled up into position, and ammunition and food supplies were maintained throughout two winters by cableways. The merits of this form of transport thus became more generally realized and at the end of the war, in 1918, the ex-Army cables were acquired by timber merchants and installed in Austrian and Italian forests, where more primitive cable systems had long been in use. Italians showed special aptitude and some found profitable employment in other countries; most of the forest cableways in France are still operated by Italian labour.

It is in the forests of the Swiss and Austrian Alps and the neighbouring mountain ranges that the greatest developments in cableway design have appeared during the past ten years, and this is due to several causes. Heavy fellings of the more easily accessible forests during the recent war, and the high post-war timber prices, led to a search for new sources of supply in areas formerly considered to be economically inaccessible. Other causes were the greatly increased cost of forest labour and the consequent need for more mechanization, and finally the invention in Switzerland of a radically new type of light cable equipment which not only transports timber, but collects it directly from the stump.

A considerable proportion of Europe's forests are on mountain slopes or other difficult terrain, and a very brief description of the commoner methods of timber extraction from such areas may be useful before considering cableway systems.

Where snowfall is sufficient and the slopes not too steep, extraction by sledge down prepared tracks by animals or manpower forms the cheapest and commonest method of bringing out logs and firewood in most Central European countries. Timber slides or chutes are also still used on favourable slopes and where the amount of timber available on one site justifies their construction, but they are now becoming rare. On steeper slopes, the force of gravity becomes a hindrance instead of a help, and the skidding or sliding of logs downhill is then highly dangerous and often impracticable owing to the serious damage caused both to the timber itself and to the remaining standing trees. The skidding paths are also frequently a source of serious soil erosion. On such steep slopes the construction of mountain roads or tracks for sleds or wheeled transport is very costly and usually uneconomic, and even when the roads are built the problem of extraction to them remains. Tractors are uncommon as they involve too much capital expenditure for the small forest owners in Central Europe and would generally be used only for a few months each year, the small farms in the mountains being chiefly pastoral. In Sweden, however, where agricultural tractors are used for arable cultivation near the forests, the use of such tractors for timber haulage is now becoming general. The large power-logging machines and high-lead cable-skidding equipment used in Canada and America are practically unknown in Europe since the forests are usually divided into small individual holdings and large clear fellings are rare even in wartime.

The general advantages of cableway extraction compared with other mountain logging methods can be easily explained. Gravity cableways or 'aerial ropeways' can be used on steep slopes, up to 45°, and take the shortest and most direct route from the felling site to the unloading point, which is usually on a main road or railway. Sudden changes of gradient, steep cliffs or wide rivers across the route do not create serious difficulties. Distances up to one and a half miles can be reached with the normal portable type of cableway and, on favourable sites with steep concave slopes, only very few intermediate supports are usually necessary. The timber arrives undamaged and clean, while the damage caused to the forest is much less than by any form of ground skidding. The narrow cleared strip in the forest beneath the cable is usually less than ten feet wide and occupies a smaller area than would be required for a skidding track, which would also be much longer.

EUROPEAN GRAVITY CABLEWAYS FOR THE EXTRACTION OF FOREST PRODUCE

A cableway system is particularly suited to the difficult extraction problems associated with uneven-aged coniferous forests managed under the selection system, as the small amount of timber to be extracted at any one time is spread over a very wide area and damage to the forest is almost impossible to avoid with ordinary ground skidding methods. Again, the manpower required per unit volume of timber extracted by cableway is less than with any other hillside logging method. Only 5 men are needed to operate a modern mechanized cableway conveying up to 1,000 cu. ft. of timber per 8-hour day. The time taken to clear a felling area is also comparatively short, as a cableway can be operated in any kind of weather, except heavy snow, and since the work is not laborious, the men often work for 10 or 12 hours per day during the summer months.

Although the cableway systems described below are usually operated by gravity on mountain slopes, most of them can be easily adapted for use on level sites. A secondary winch is then required to haul back the empty carriers to the loading point. As an instance of this adaptability, a complete Swiss gravity cableway is being installed this year in North Borneo to extract Mangrove bark from level swamp forests.

Gravity Cableway Systems

In order to avoid unnecessary technicalities, the term 'gravity cableway' is used in this article to cover all systems of aerial wire ropes or cables used in the extraction of forest produce where gravity provides either the whole or a part of the power required. In Great Britain the term 'cableway' is usually limited to single-span systems with a crane or hoist for raising and lowering the load in addition to transporting it, and the first three simple systems described below would there technically be called 'aerial ropeways'. In the U.S.A. and Canada the term 'skyline yarding' would be applied to the two Swiss systems which use a mobile winch or 'yarder' in addition to gravity power. The French and Italians both use the word 'téléphérique' for most types of cableways, but horizontal cableways are called 'Blondins' after the famous tight-rope walker.

Gravity cableway systems may usefully be divided into four main types: single fixed cables; mono-cables; bi-cable or tri-cable systems; and fourthly, Skyline Cranes, and they will be considered in that order.

(1) *Extraction by Single Fixed Cable*

The oldest and simplest type of gravity cableway consists of a single cable installed on a hillside and stretched as tightly as possible between two terminal anchorages without any intermediate supports. The ideal site for this type is a steep but concave hill slope, with perhaps a stream along its foot which has to be crossed to reach the unloading point. The logs or other forest products are simply hooked on to the cable and descend by gravity directly to the lower end. After being unloaded, the hooks or other attachments are usually collected in bundles and carried up by hand to the loading point. This type of cableway has obvious limitations of gradient and site, and as no intermediate supports can be used without the introduction of special carriers, the method is only suitable for comparatively short distances and small loads.

The system is commonly used in Europe for bringing down firewood faggots. The bundles are usually suspended from the cable by a forked stick or 'crotch', cut on the felling site; this sometimes burns through by frictional heat before it reaches the bottom unless the cable is kept well lubricated. Where the slope is too slight for sliding, a long iron hook, with a small deeply-grooved pulley attached to run on the cable, often forms a simple and cheap carrier. A small power-driven winch is now often used at the lower end of this type of cableway to assist in the installation of the cable and to maintain it at the right tension. The above simple cableway is similar to the 'single-wire' system now used in eastern Canada and the U.S.A. for the extraction of pulp logs, but the wire cable used in Europe is heavier and the ingenious and varied attachments recently introduced in Canada have not yet reached Europe.

(2) *Monocable Systems*

Although these are actually single-cable systems they operate quite differently from the fixed gravity cable line described above. The ordinary monocable consists of a long endless cable which is kept in continuous movement over a series of supports by a small power-driven winch or a capstan which is included in the circuit. This method is most commonly used in quarries, mines and foundries, where a large number of small and similar loads have to be conveyed regularly and continuously. The loads are placed on the cable equidistantly and are usually loaded and unloaded without halting the steady movement of the cable. The application of this type of cableway to forestry requirements

offers obvious difficulties and its use is generally limited to the extraction of pulpwood, fuelwood or pitprops from hardwood coppice or from young plantations.

A recent special adaptation of the monocable system to forest exploitation is a Franco–Swiss invention called the 'Câble-Lasso'. This was first used in France and operated by prisoners of war about ten years ago, but is now made in Switzerland and widely exported.

The Lasso cable is supported on tubular steel brackets which are usually clamped to standing trees about 40 yards apart and at a sufficient height to keep the loads clear of the ground (fig. 4). These brackets are fitted with ingeniously designed roller-bearing pulleys having long projecting teeth, or spikes, on both flanges to prevent the cable from slipping off the pulley during sudden changes of speed or of tension. As the supports are numerous and allow small changes in direction to be easily negotiated, the lay-out can be a wide, irregular circuit, to suit the terrain. Each load is carried in a chain sling attached to a long twisted-steel hook which is fixed firmly to the cable as it passes the loading site and is unhooked again at the lower terminus.

The cable moves at about 2 to 3 m.p.h. and the loads are usually placed about 6 yards apart. The continuous lifting and loading is laborious and recent improvements include a portable automatic loading platform. Two men carry the wood to the platform and two more men are needed to load it on to the cable. The maximum single load is 1½ cwt., and with a crew of 8 men about 40 cords of firewood per day can be loaded and transported for an average distance of 1,000 yards.

Both installation and operation require an experienced crew and at present most of the available crews are Italians, who usually work on a contract basis. During the present year an Italian party of 6 men has installed and operated the first Lasso cable in Scotland.

The special advantages of the Lasso system are its simplicity and ease of installation, and also its portability. It works either on level ground or on moderate slopes. On the other hand, as in all monocables, the maintenance of tension on the cable is a difficulty, as heavy counterweights must be used on the lower pulley wheel; the logs, moreover, have to be brought by hand from the stump to the cable.

(3) *The Bi-cable or Tri-cable System*

This system consists of one or more fixed main or 'track' cables, supported on wooden trestles and anchored firmly at each end, along which a number of carriages are hauled and controlled by a separate moving or 'traction' endless cable. This is lighter than the main cables and is tensioned round a large pulley wheel at each end of the cableway, the tension usually being maintained from the lower end by a heavy counterweight which may consist of large rocks suspended in a wire cage. The cable is controlled from the top end, where it passes round the two sheaves of a large pulley wheel which is fitted with a hand controlled band-brake. As the illustration shows (fig. 1), the end of a thick Ash stick thrust firmly against the rim of the return pulley serves as a primitive additional brake. This crude method of control requires a minimum of equipment and is commonly used on small tri-cables in France and Italy. If the slope of the site is steep enough (over about 12%) the traction cable may be operated entirely by gravity, and the speed controlled by a large brake drum at the upper end. On slopes less steep the traction is assisted by a small power-driven winch at the lower end.

On a single fixed main cable only one load is usually brought down at a time, since the empty carriage is returned to the top along the same cable, but sometimes small light carriages are returned on the traction cable. This method is very slow in operation and only suitable for short distances, e.g. 500 yards.

Most of the larger semi-permanent forest cableways at present operating in Central Europe are of the type known as 'tri-cables' and have two parallel main or track cables, one of which is used for the descending loads while the other, which is often smaller in diameter, serves only for the return of the empty carriages. For a large number of successive small loads, such as pulpwood or firewood, detachable carriages are used and the movement of the traction cable may be a slow, continuous circuit, as in the ordinary monocable system, the loads being removed on a shunt rail as they pass round the lower end.

For heavier loads and short distances the 'jigback' or 'to and fro' (*va et vient*) method of operation is often used, the movement of the traction cable being halted and with gravity power often reversed, during the loading at the upper end and unloading at the lower, which are done simultaneously.

There are many kinds of carriages and attachments used to suit various types of loads. An old Italian device called the 'Vatellina' (fig. 2) consists of a twin-pulley wrought-iron carriage attached to the traction cable by a heavy split ring and a simple clamp. This attachment is simple, cheap, light in weight, secure yet easily released, and is in very general use on European forest cableways.

A primitive tri-cable system in the Haute Savoie, France.

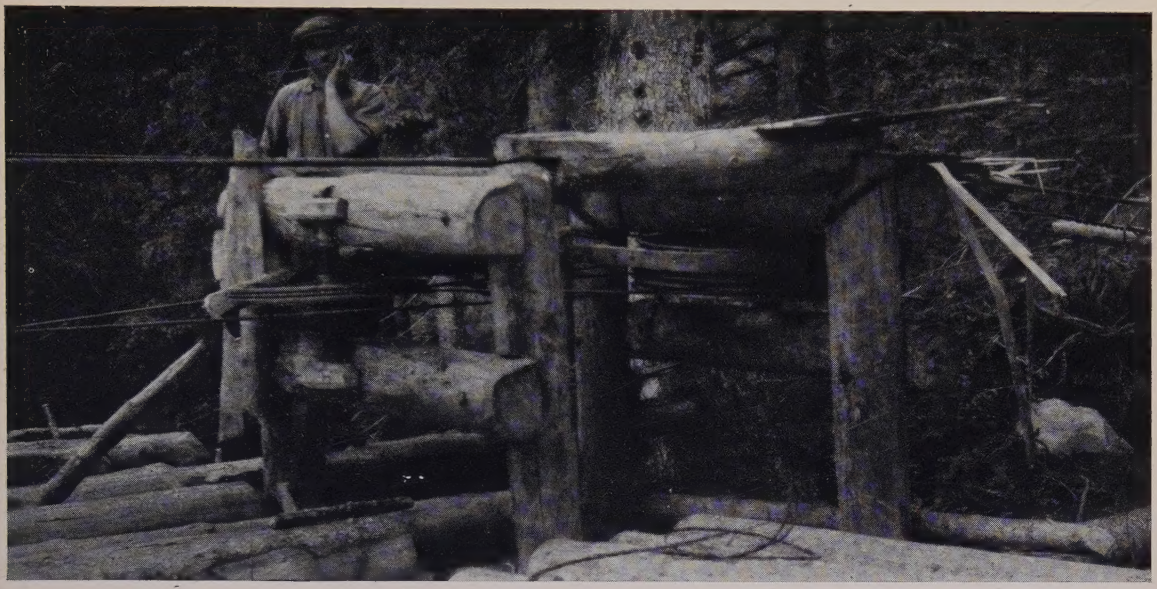


Fig. 1. Anchorage and control device at upper end of the cableway.
The simple band-brake on the double-sheaved control pulley regulates the speed of the traction cable. The 'return' pulley in front serves to pass the cable from the first sheave over to the second and so increase the frictional surface. The main cables can be seen crossing the trestles to an anchorage on the right.

Fig. 2. Locally made wrought-iron carriage with the common 'Vatellina' split ring and clamp attachment on the traction cable.

A modernized tri-cable system in Austria.

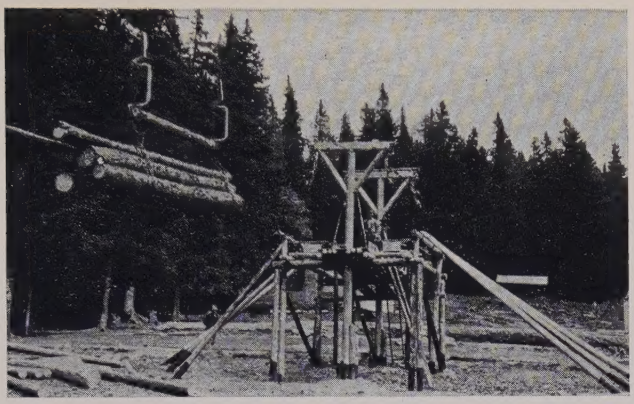


Fig. 3. A load approaching the unloading platform. On arrival the quick-release attachments on the chain slings are struck open and the logs roll down the inclined poles to the ground. Two steel cable-shoe supports, the upper for the main cable and the lower for the traction cable, can be seen at each end of the trestle transoms.

A monocable system.

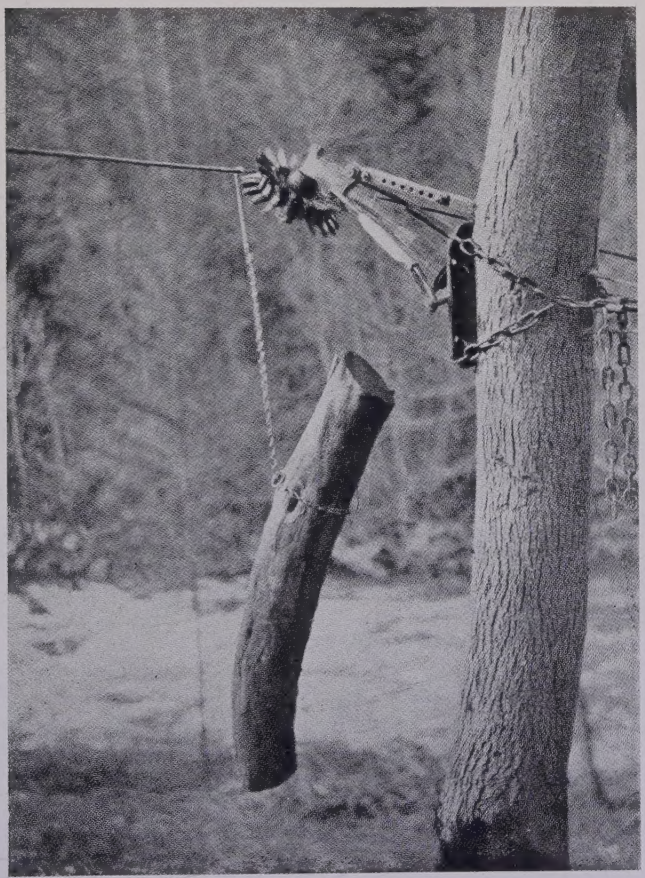
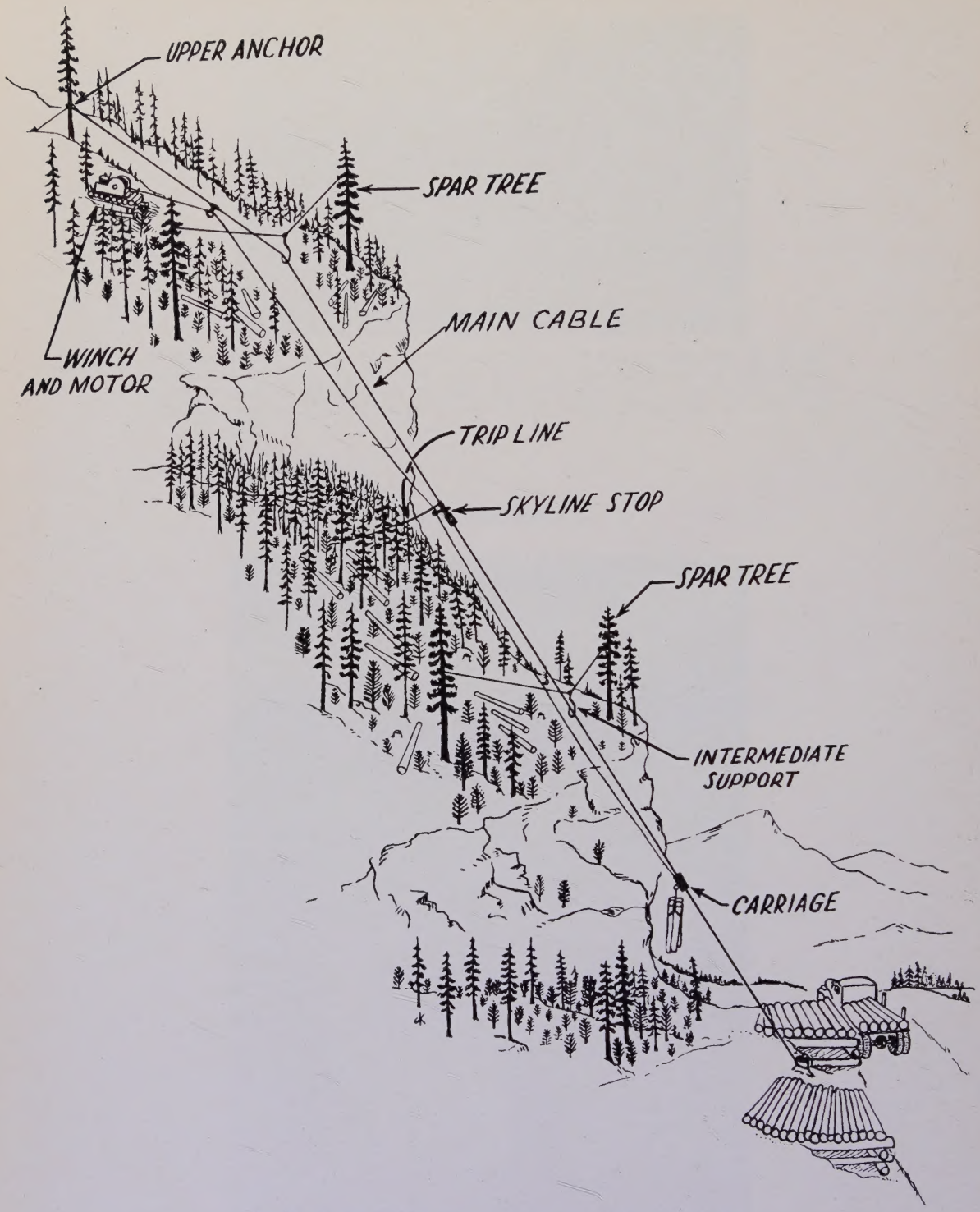


Fig. 4. Log passing a cable support attached to a living tree. (Lasso system).



Profile of the Skyline Crane system, showing method of operation; the logs are descending to the unloading point.

Bi-cable or tri-cable systems of the above types have been extensively used for many years in Central Europe (fig. 3). They are specially suited to long-distance haulage, sometimes over 5 miles in length. Their length is only limited by the conformation of the site and the mechanical difficulty of maintaining an even tension on a series of long slopes. The heavy and intricate trestle supports needed for these multiple cables, however, and the time taken to install them, limit their use to semi-permanent sites where a large amount of timber has to be removed over a long period. Another great disadvantage is that, as there is no method of raising the load up to the traction cable, all the timber has first to be taken to a few specially selected platform loading points and frequently all loading is confined to the upper end of the cable.

(4) *The Skyline Crane System*

The general lay-out and operation of the Skyline Crane* can best be understood from the diagram opposite. Its most distinctive and valuable feature—as the name indicates—is its ability to collect a log at stump and in one continuous uninterrupted movement, hoist and carry it directly to any desired point on road or railway, so surmounting at little cost the most laborious phase of extraction in steep, difficult country. The system employs a single main cable and an operating (i.e. lift-and-traction) cable. The main cable is about 1 in. in diameter and is usually suspended from living trees. If the trees are small and near together, they are strutted apart with a horizontal strut placed immediately above the cable attachment (fig. 8). Otherwise they may be steadied by two compensating guy ropes. On slopes of 3 to 1 and with loads of one ton, single spans of up to 2,000 yards have been used.

The operating cable which passes through the carriage and controls it, is lighter than the main cable and ends in a heavy 'choker-hook' to which the load is attached by small cable 'chokers'. The upper end of the operating cable is attached to the drum of the yarder, a small power-driven winch mounted on skids (fig. 6), which is always sited near the top anchorage of the main cable, as shown in the diagram.

The lifting of the timber from the ground up to the carriage is effected by the yarder and operating cable, which also hauls back the empty carriage after unloading at the lower end. To enable the most suitable speed to be used for each operation the engine has a special gearbox with 5 gears. Internal brakes on the winch drum control the descent of the loaded carriage. This is halted at any desired point along the cableway, to which logs are to be brought in, by an ingenious Skyline 'stop' device, on the main cable, which can be moved along it by a small trip-line from the ground (fig. 7). The carriage on striking the fixed 'stop' automatically locks to it, at the same time releasing the weighted choker-hook which falls slowly to the ground under the control of the operating cable. The load is then attached and hauled up to the main cable. When the choker-hook reaches the carriage it strikes a small lever which automatically releases the carriage from the stop, allowing the carriage, with its load clear of the ground, to run down the main cable to the unloading point under the control of the winch operator.

When used on a level site, the yarder winch is anchored near the unloading point to haul in the loaded carriage. A secondary winch is then generally anchored at the other end to haul back the empty carriage, but for short distances a second drum on the yarder at the unloading point may be used instead. The equipment is light and portable. For short straight hauls, up to about 1,000 yards, it can be set up by four men in 2 or 3 days, and can be dismantled and installed on a neighbouring site in about 4 or 5 days. It is this portability and rapid installation that enables the Skyline Crane to collect logs directly from their felling sites and avoid long-distance ground skidding. On wide continuous hillside forests the cable is installed straight up the slope, and after a strip of forest has been cleared of logs the installation is moved successively to adjacent strips until the whole felling area has been logged. The width of strip served by each installation will vary from 200 to about 400 feet, depending on the height of the cable and the density and constitution of the forest. Damage to the forest when hauling logs up to the main cable can be avoided by careful selection of haulage routes and also by diverting the moving logs from patches of regeneration, etc., by putting the traction cable through a patent self-opening snatch-block attached to the base of a tree. Since the front end of the log is elevated by the high lead of the cable, the hauling-in does less damage than animal dragging, especially on steep slopes. Only a helicopter could extract with less damage to timber and forest. The rapidity and ease of installation also enables small isolated stands of timber to be logged economically, such forests being often reached by installing a temporary branch cableway as an

* This name, adopted by the Swiss inventor, Jacob Wyssen, should not be confused with the 'Skyhook' system invented in 1942 by P. Grabinski; the latter features a self-propelled vehicle, suspended on two heavy cables, in which the operator rides, and lifts loads of up to 50 tons [cf. *For. Abstr.* 7 (No. 283)].

extension from the main line. The standard equipment takes loads up to 1½ tons, but a new type is now being designed for 10 tons, intended for heavy tropical timber and for the big timber of the Pacific coast. Haulage distances are limited by the capacity of the cable-drum on the winch, the maximum length at present being about 1½ miles. The average output for this distance in mature softwood forests is 150 cu. ft. per hour from selection fellings and some 200 from clear fellings. This is with a crew of only 4 or 5 men, so the daily production per man is very high compared with other methods of extraction from steep or difficult terrain. Engineers are not required for operating the system, but two Skyline experts are said to be needed at the first installation and to train a crew of operators. While all mountain logging has its risks, insurance statistics show that Skyline Cranes cause fewer accidents than animal or tractor haulage on steep ground.

A recent Skyline Crane installation in Nyasaland may usefully be cited. The problem was to bring down a large quantity of Mlanje Cedar both as sawn timber and logs, from a high plateau with precipitous slopes on Mlanje mountain. The distance from the rim of the plateau to the nearest extraction road below was 1½ miles. Owing to the difficult profile, only two intermediate supports could be used and one of the single spans was over 2,000 feet. There were no trees on the site suitable for supports, and high trestles had to be erected to clear the required 20-foot lengths of sawn timber (fig. 5). The whole cableway was installed by untrained African labour under the supervision of two Swiss engineers, and was operating within 8 weeks of the team's arrival. The output now averages 1,000 cu. ft. of sawn timber and logs per day, and the cost per cu. ft. is about one-tenth of the former extraction by head-loads down a steep mountain track.

One of the disadvantages of the Skyline Crane is its present high initial cost, but factory methods of production are expected to reduce this in the future. The mechanical life of the equipment, moreover, is stated to be 15 years, and the main cable will carry 50,000 tons before replacement.

Another present drawback is that the logs or sawn timber are usually carried vertically, necessitating high supports. This can be avoided by the use of an additional small carriage to support the load, and although this method slows down loading, it is sometimes worth while for the extraction of long poles.

Variations on the principle of the Skyline Crane system have already appeared in Switzerland and elsewhere but without much success, except perhaps for the 'Simplon' cableway which can be seen at Ganthertal, near the Simplon Pass. This is a semi-permanent, heavy, cable system specially designed for conveying logs across valleys or depressions up to about a mile in width and entailing a long unsupported span. A 'stop' device is used on the main cable, as in the Skyline system, but the carriage is much heavier, has two sets of lifting blocks and carries the timber horizontally. In this it resembles the Skyhook, but is much smaller in scale and is controlled from the ground by winches at both ends of the line; on suitable sites it could be controlled by gravity.

While the older types of European gravity cableways have long been known and used in other parts of the world (e.g. South Africa, Tanganyika), the recent more efficient types are only now beginning to show their possibilities overseas. No portable cable equipment has yet been devised to deal with the larger, heavy logs of certain parts of the tropics, nor is portable equipment likely to compete successfully with the long-established high-line and high-lead skidding systems of North America, except in forests inaccessible to standard American logging equipment. Nevertheless, Skyline Cranes are now on trial in various parts of Africa, in the U.S.A. and British Columbia, and also in Great Britain, along with the Lasso (Scotland), while a Skyline model capable of carrying a 10-ton load is expected in 1953.

In extraction from young plantations, the lack of trees suitable for supports and anchorages adds somewhat to the cost of installation, but on appropriate sites the articulated steel-pin anchors used in the Royal Engineers have proved a quick and satisfactory solution.

Few reliable comparisons of cable extraction costs with alternative methods exist, especially as the relative damage to the standing crop and soil is almost impossible to assess. It should be remembered in making such comparisons that cableways are usually operating on more difficult sites where the costs of other methods would be abnormal or prohibitive.

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Skyline Cranes.

Fig. 5. Simple trestle support and Skyline Crane conveying a ton of sawn Cedar from Mlanje Plateau, Nyasaland, down to a road below. Length of cableway 2600 yards. Daily output 1000 cu. ft.

Fig. 6. A Wyssen yarder operating the Skyline Crane shown above. It is anchored down to a log buried in the trench seen on the left.

Skyline Cranes (*continued*).

Fig. 7. A two-ton log being hoisted up to a Skyline carriage. The stop, with trip-line, is to the left of the carriage.

Fig. 8. A descending load approaching the main cable support suspended between two living trees, strutted apart.

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(Reprints of the above article are available from Central Sales Branch, Commonwealth Agricultural Bureaux, Farnham Royal, Bucks, England, at 2s. each.)

ABSTRACT SECTION

0. FORESTS, FORESTRY, AND THE UTILIZATION OF FOREST PRODUCTS: GENERAL

For general *regional* accounts see section 90

0 (048.1). BIBLIOGRAPHICAL LISTS

See also Nos. 215–6, 748, 771, 773, 796.

1. Bibliographie des ausländischen forst- u. holzwirtschaftlichen Schrifttums: Folge 4 enthält Titel des Jahres 1951. **[Bibliography of foreign literature on forestry and wood utilization: No. 4—titles of 1951.]** *Mitt. Bundesanst. Forst- u. Holzw.* No. 27, 1952. pp. v + 212. Price [£1. 2*s*. 6*d*.]

0 (052/054). PERIODICALS

2. SMITH, W. A., KENT, F. L., and STRATTON, G. B. [Editors]. **World list of scientific periodicals published in the years 1900–1950.** Butterworths Scientific Publications, Ltd., London. 3rd ed., 1952. pp. xvii + 1058. Price £12. 12*s*.

3. ***Bulletin d'Information de l'Institut pour l'Étude Agronomique du Congo-Belge (INÉAC).*** Institut pour l'Étude Agronomique du Congo-Belge, Brussels. Quarterly. Price not stated.

A new bulletin, to be issued under the same cover as the *Bulletin Agricole du Congo Belge*, with the object of reviewing in general terms the progress of the fundamental studies carried out by INEAC. Vol. 1 (1/2) accompanies *Bull. agric. Congo Belge* 43 (2), 1952. Abbreviation in *For. Abstr.: Bull. Inform. Inst. nat. Étude agric. Congo belge.*

0 (058). ANNUALS. YEARBOOKS. DIRECTORIES

See also Nos. 82, 913.

4. **[Yearbook of the Forestry Institute, 1950–51.]** Forestry Institute, Teheran 1951. pp. 171 + 31 + 2 tbls. [Per.] Price 40 *Rials*.

This, the first of its kind, includes the following features: short history of the Forest Service; circumstances of the establishment of the Institute of Forests, its functions and activities to date; the central administrative organization; cadre of officers by regions; publication programme of the Institute; also, as an appendix, a list of forest laws and regulations.

5. **The Empire Forestry Handbook.** Empire Forestry Association, London. 6th ed., 1952. pp. 90. Price 15*s*.

0 - - 011. TERMINOLOGY. NOMENCLATURE

See also Nos. 100, 116–9, 209.

6. EDLIN, H. L. **A forester's glossary.** *Wood* 17 (7; 8), 1952 (269–71; 310).

Defines 231 terms used in nursery work, silviculture, fencing, draining, and simple road construction.

0 - - 015. MATHEMATICS. STATISTICAL METHODS

See also Nos. 601, 809, 898

7. SETTEN, G. G. K. **A note on statistical methods and forestry.** *Malay. Forester* 15 (2), 1952 (73–80). 8 refs.

0 - - 087. APPARATUS, INSTRUMENTS, MACHINERY: GENERAL

See also No. 914.

8. **Equipment news.** *Unasylva* 6 (1), 1952 (35–8).

Descriptive notes, with photographs, of the following amongst others: spiral rotor trencher (U.S. Forest Service, Equipment Development Center, Arcadia, Calif.); Forestière C.D.4 (improved horizontal bandsaw from Etablissements C.D., Paris, Seine) [cf. *For. Abstr.* 11 (Nos. 449, 1241)]; logging arch (Universal Power Drives Ltd., Perivale, Mdx., England); Hayes Simplex loader, consisting of one load-line drum and smaller drums for swinging boom under power/main-line drum (Hayes Mnfg. Co. Ltd., Vancouver 9, Canada); King model L82SW Tandem Axle Logging Semi-trailer for carrying 16 one-cord bundles of pulpwood (Truck Engineering Ltd., Woodstock, Ont., Canada); Easy Cut Saw (Simonds Canada Saw Co., Montreal) [cf. *For. Abstr.* 12 (No. 1306)]; Nelson pole-shaving machine (Nelson Electric Mnfg. Co., Tulsa, Okla.).

1. FACTORS OF THE ENVIRONMENT. BIOLOGY

11. SITE FACTORS: CLIMATE, SITUATION, SOIL, HYDROLOGY (WATER AND SOIL CONSERVATION)

111. *The Atmosphere. Meteorology. Climate and Microclimate*

111.1. Composition, Structure, Mechanics and Thermodynamics of the Atmosphere in General

9. SELM, H. R. DE. **Carbon dioxide gradients in a Beech forest in central Ohio.** *Ohio J. Sci.* 52 (4), 1952 (187–98). 37 refs. C.G.B.

A study of CO_2 concentrations at different levels, at various times of day and in different seasons. Average spring and summer concentrations (8 a.m. to 6.30 p.m.) were 0·030 and 0·031 volume % respectively. Spring concentrations at all levels showed greater day-to-day variations, and were usually lower than summer concentrations. Spring gradients were regularly constant from the soil to the as yet unclosed canopy. Although gradients were not always constant, much of the photosynthetic CO_2 in summer also emanated from the soil level. Average summer daytime concentrations were: at 3 in., 0·035 volume %; at 3 ft., 0·032; at

30 ft., 0·030; and at 41 ft., 0·031. Wind direction in itself had no apparent effect on CO_2 concentrations, but indirect effects were observed owing to impedance in certain directions by dense vegetation etc. Rain increased the CO_2 content, but the increase did not last into the following day. Concentrations at night were higher than during the day, unless influenced by considerable air mixing. Maximum rates of change in concentrations usually occurred in the early morning and late evening. [Cf. *For. Abstr.* 10 (No. 61).]

111.2. Radiation and Temperature

See also Nos. 66–7.

10. CHRISTY, H. R. **Vertical temperature gradients in a Beech forest in central Ohio.** *Ohio J. Sci.* 52 (4), 1952 (199–209). 8 refs. C.G.B.

Temperatures were measured at 8 different levels in Beech forest in different seasons. In summer, the greatest extremes (46°–89° F.) occur in the canopy, and temperatures at other levels above and below the forest floor are more stable than at any other season. Soil temperatures are higher near the surface (54°–66°) than at a depth of 4 ft. (51°–61°). In autumn, the greatest extremes (34°–85°) also occur in the canopy, but there is some stratification due to thinning of the canopy by leaf fall and to the penetration of sunlight. Minimum soil temperatures are higher in the lower soil layers than near the surface. Winter minimum temperatures are lowest near the substrate (— 6°) but temperatures at all levels are more uniform than in the summer. In the soil, minimum and maximum temperatures are slightly lower near the surface than at a depth of 4 ft. Beneath the leaf litter, with or without snow cover, temperatures do not go below freezing. In the upper soil, temperatures are between 40° and 49° for 74% of the winter, but air temperatures occur in that range for 7–10% of the time, and are lower for 88–89% of the time. Minimum and maximum air temperatures in spring occur at the lower levels. Stratification above the lower levels is not pronounced, because absence of the canopy still gives rise to turbulence. Soil temperatures are high near the surface (up to 92°), and diffusion of heat downward is more rapid than at any other season. *From author's summary.*

11. SAHAROV, M. I. Vlijanie vetra na osveščennostj v lesu. **[The influence of wind on illumination within the forest.]** *Dokl. Akad. Nauk SSSR* 67 (5), 1949 (913–6). 6 refs. [Russ.] A.P.B.

Tabulates and discusses some data obtained in the Minsk Lespromhoz under 6- to 17-year-old stands of Spruce, Pine, Birch, and Alder, of different ecological types and different densities, using an electrical photometer. In all cases wind (velocity 6–8 m./sec.) increased not only the amplitude of variation but also the mean light intensity under canopy.

12. ELAGIN, I. N., and ZVORYKINA, K. V. Osveščennosty pod pologom nekotoryh tipov širokolistvennyh lesov (severozapadnyĭ Kavkaz). **[Illumination under the canopy of some types of broadleaved forest in NW Caucasia.]** *Dokl. Akad. Nauk SSSR* 66 (4), 1949 (713–6). 12 refs. [Russ.] A.P.B.

111.8. Climatology. Climate and Microclimate

See also Nos. 9–12, 172, 211, 349, 491, 493, 891

13. BURGER, H. Waldklimafragen. Mitteilung IV. Meteorologische Beobachtungen im Brandiswald. **[Forest climate. Part IV. Meteorological observations in the Brandiswald.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 27, 1951 (19–75). 50 refs. [G.g.f.]

Earlier studies in this series were published in 1931–3. The studies described here were made in 1929–49 in the Brandiswald at an altitude of 900 m. The data are set out in a number of tables and graphs and discussed in detail; they refer to precipitation, atmosphere, temperature and humidity, and evaporation, on open ground in forest areas and under various types of forest stand. (1) *Precipitation:* 71% of the amount of precipitation measured in the open fell directly on the soil in (*a*) an open stand of Spruce, 85% in (*b*) a gap in forest treated by successive fellings, and only 53% in (*c*) selection forest. There is snow cover for some 3 months of the year in this region; that in (*a*) and (*b*) is about $\frac{2}{3}$ and that in (*c*) only $\frac{1}{3}$ of that in the open. In large openings in the forest, however, it may be considerably more than in open country. (2) *Air temperature:* The values (based on 100,000 readings) of mean annual temperature at 125 cm. above the ground were 7° C. in the open (i) and 6·3° in selection forest (ii). The difference in mean daily temperature between (i) and (ii) was only 0·1° in winter, rising to 0·9° in spring, 1·1° in summer, and 0·7° in autumn. The amplitude of variation in temperature was 55·3° in (i) and 47·9° in (ii). Depth of soil freezing inside the forest is only $\frac{1}{4}$ or $\frac{1}{5}$ of that in open ground fully exposed to all winds. The effect of the forest in this respect is also found on open ground sheltered by it from the wind. (3) *Atmospheric humidity:* Mean relative humidity for (i) was 77% at 125 cm., and 81% at 50 cm. above the ground, and the corresponding figures for (ii) were 84% and 87%. The amplitude of variation in relative humidity was ca. 16% greater in (i) than in (ii). (4) *Evaporation:* Mean evaporation in (ii) during the summer months (May–Sept.), as measured with evaporimeters, was only 40% of that in (i), and atmometers gave similar results. At the same temperature, evaporation in (i) at 70% relative humidity equals that in (ii) at 50%. (5) *Wind velocity:* Wind velocity in (ii) is only 32% of that in (i).

14. BURGOS, J. J., CAGLIOLO, A., and SANTOS, M. C. Exploración microclimática en la selva Tucumano-oranense. **[Studies on the microclimate of the forests of the Tucumán-Oran region.]** *Meteoros, Buenos Aires* 1 (4), 1951 (314–41). 9 refs. [Span. span.e.] A.P.B.

A study was made in the forests of the Andean foothills of temperatures, precipitation, evaporation and frost hazard, in order to determine the suitability of the region for certain crops. Tables and graphs show the data collected.

114. *Soil. Soil Science*

See also No. 880.

114.1. Soil Physics

See also Nos. 10, 25, 37–8, 350, 402

15. Knapp, R., Linskens, H. F., Lieth, H., and Wolf, F. Untersuchungen über die Bodenfeuchtigkeit in verschiedenen Pflanzengesellschaften nach neueren Methoden. **[Soil-moisture investigations in different plant communities, using modern methods.]** *Ber. dtsch. bot. Ges.* 65 (5), 1952 (113–32). 29 refs. [G.g.] O.B.D.

Discusses reasons for the unsatisfactoriness of the usual method of measuring soil moisture by the loss in weight of a sample at 105° C., and describes experiments in various plant communities using the Bouyoucos and Mick method [see *For. Abstr.* 9 (No. 49)], which—so long as certain disadvantages are allowed for—is much more satisfactory.

16. Smith, J. H. G. **Possible uses of Krilium in silviculture.** *For. Chron.* 28 (2), 1952 (61–3). 2 refs.

114.2. Soil Chemistry

See Nos. 18–20, 25, 39, 61, 350, 402, 546.

114.3. Soil Formation. The Soil Profile and its Development. Litter, Humus etc.

See also Nos. 39, 199–200, 238, 350, 402, 544, 546

17. Fillipovič, Z. S. Prudy, lesnye polosy i solontsy. **[Reservoirs, shelterbelts and solonets soils.]** *Počvoved.* 1951 (12), (736–40). 1 ref. [Russ.] A.P.B.

Reports the development, first noted in 1936, of patches of solonets soil on what appears to have been formerly chernozem near reservoirs, and in and between associated shelterbelts on the Kamennaya Steppe, ascribing their formation to the influence of the raised groundwater level (impedance of soil drainage). An editorial comment states that though the matter requires careful study, some recent evidence suggests a rather different explanation.

18. Metz, L. J. **Calcium content of hardwood litter four times that of Pine; nitrogen double.** *Res. Note Stheast. For. Exp. Sta.* No. 14, 1952. pp. 2.

Tabulates figures showing contents of N, Ca and Mg of 14 species grown in Piedmont forests, and litter (in lb./acre) and quantities of N and Ca returned to the soil in leaf fall for Loblolly and Shortleaf Pine plantations, mixtures of the two, Shortleaf Pine mixed with hardwoods, and hardwoods alone.

19. Zaĭcev, B. D. Opyt količestvennogo vyraženija razloženija organičeskogo veščestva v počve. **[An attempt to express quantitatively the decomposition of organic matter in the soil.]** *Dokl. Akad. Nauk SSSR* 67 (1), 1949 (135–7). [Russ.] A.P.B.

Regression equations are derived to express the correlations between total Ca content of the organic matter of the A_0 horizon (raw humus and peat) and its degree of decomposition, in podzol and bog soils, with special reference to the influence of tree species (hardwood, Pine and Spruce) on the podzols.

20. Novorossova, L. E. O biologičeskom nakoplenii kremnekisloty v počvah elovyh lesov. **[The biological accumulation of SiO_2 in Spruce forest soils.]** *Počvoved.* 1951 (2), (115–8 + 1 plate). 5 refs. [Russ.] A.P.B.

Russian data on the mineral constituents of Norway Spruce needles show that of the total ash content based on oven-dry weight (3·5–6·4%), SiO_2 accounts for (20–)33–44%, the corresponding figures for Scots Pine being, total ash 2·3–3·0%, of which 3·9–9·6% is SiO_2. The author's microscopic examination of carefully ashed Spruce needles revealed large cubic SiO_2 crystals scattered in a fine crystalline mass probably consisting mainly of carbonates and oxalates of Ca and Mg. Using other Russian figures, she estimates that in 1000 years the litter fall of Spruce would return ca. 53–64 metric tons/ha of SiO_2 to the soil, and owing to its relative insolubility, most of this would remain in the upper horizons. Her own analyses of podzols under two Spruce types (*Piceetum oxalidosum* and *P. myrtillosum*) in protection forest show SiO_2 contents ca. 5% higher for the upper (15–30 cm.) than for the lower (> 45 cm.) horizons of the mineral soil.

21. Lossaint, P. Influence de la végétation forestière et de la mise en culture sur l'évolution de sols sableux aux environs de Strasbourg. **[The influence of forest vegetation and of cultivation on the development of sandy soils round Strasbourg.]** *Annales agronomiques, Paris (n.s.)* 2 (6), 1951 (803–17). 26 refs. [F.] L.S.

Soils under *Querceto-carpinetum luzuletosum* proved to be podzolized but less so than those under *Quercetum medium-europaeum molinietosum.* On soils under agricultural crops podzolization has been arrested.

22. Suzuki, T., and Hatiya, K. **The characteristics of the soil in the east Asiatic warm-temperate forest climax.** *Bot. Mag., Tokyo* 64 (753/754), 1951 (87–92). 11 refs. [Jap.e.] I.M.I.

Results of a survey in the Izu peninsula, where nearly all the climax types of temperate east Asia are represented, shows that the climax of broadleaved evergreens (*Machilus-*, *Shiia-* and *Cyclobalanopsis*-type forests) are on soil with a higher pH value in the A horizon than in the B horizons, while the reverse is true for the deciduous (*Fagus*-type) forests [cf. *For. Abstr.* 14 (No. 26)]. Three types of profile are distinguished within the climax area of the broadleaved evergreens in the Izu peninsula. The first is widely spread and well differentiated, the other two are local and imperfectly differentiated, owing to their high (drier) situation and the fact that percolating water is retarded by the thick litter.

23. Jarošenko, P. D., and Dženjuk, E. I. Značenie vesovogo analiza podstilki pri harakteristike lesnyh cenozov. **[Importance of gravimetric analysis of litter in characterizing forest associations.]** *Dokl. Akad. Nauk SSSR* 81 (1), 1951 (89–92). 2 refs. [Russ.] A.P.B.

Gives some account of studies made near Lwow in summer 1949 in Beech, Pine, Oak/Beech, Beech

with some Pine, and Oak with some Pine, 14 associations being represented. Litter + humus was removed from sample patches (50 × 50 cm.) and the various fractions (leaves; twigs; fruits, cones; herbaceous residues; semi-decomposed (raw) humus; and fully decomposed (mild) humus) separated, dried and weighed. Determinations were also made of the depth and total weight of the layer, and exchangeable acidity (pH in KCl extract, using a universal indicator) of the mild humus layer and adjacent top soil. Some typical results are tabulated to show that this type of analysis is a sensitive indicator of differences between the associations; those quoted refer chiefly to the % of mild humus in the total dry matter. This, in the Beech and Pine types, decreases with increasing moisture of the types. Figures are also included for the % twig content of the litter, which, in general, proved to be higher in mixed than in pure woods. The method might be further improved by chemical analysis of the different fractions.

24. ELAGIN, I. N., and ZVORYKINA, K. V. Zapasy podstilki v nekotoryh tipah širokolistvennyh lesov predgorja severozapadnogo Kavkaza. **[Amounts of litter in some types of broadleaved forest on the foothills of NW Caucasia.]** *Dokl. Akad. Nauk SSSR* 64 (5), 1949 (715–8). 9 refs. [Russ.] A.P.B.

25. TRIMBLE, G. R., JR. **A method of measuring increase in soil depth and water-storage capacity due to forest management.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 47, 1952. pp. 8. 4 refs.

The effect of management was measured by determining organic-matter content and pore space of soils, for humus layer, A_2, and subsoil, found under different forest-stand conditions (well stocked mature stands, understocked young stands and all-aged grazed stands). Results are tabulated.

114.4. Soil Classification. Soil Types

See also Nos. 17, 19–22, 32–3, 199–200, 211, 317–9.

26. OHMASA, M. **Forest soils of Japan. Report 1. Studies of Beech forest soils.** Government Forest Experiment Station, Meguro, Tokyo. 1951. pp. 243 + 76 plates. [Jap.e.]

Thirteen main soil types (brown forest soils, podzolic soils and a mineral groundwater soil) are described. There is a 17-page English summary and the numerous tables and illustrations have English legends. [Cf. *For. Abstr.* 14 (No. 22).]

27. CROSSLEY, D. I. **The soils on the Kananaskis Forest Experiment Station in the sub-alpine forest region in Alberta.** *Silv. Res. Note For. Br. Can.* No. 100, 1951. pp. 32 + 3 maps. 18 refs.

The first detailed forest soil survey that has been made in the Canadian Rockies.

28. NORTHCOTE, K. H. **A pedological study of the soils occurring at Coomealla, New South Wales.** *Bull. Commonw. sci. industr. Res. Organ. Aust.* No. 264, 1951. pp. 128 + 7 plates + 2 maps. 52 refs.

The vegetation of this area consists of two separate edaphic complexes—the *Casuarina/Callitris/Eucalyptus* (mallee form) on the highland areas, and the *Eucalyptus bicolor/E. rostrata* of the river terraces and flats.

114.5. Soil Fertility. Soil Toxicity. Soil Depletion and Exhaustion

See also Nos. 61, 189, 205, 542–6.

29. KRISO, K. Die Ableitung von Standortspektren aus Vegetationsaufnahmen und ihre Anwendung als standortsdiagnostische Hilfsmittel. **[The compilation of site spectra from vegetation surveys and their use as an aid to the diagnosis of sites.]** *Forstwiss. Cbl.* 71 (5/6), 1952 (151–69). [G.g.]

Proposes a method of compiling 'site spectra' from the data of ordinary vegetation surveys, based on the indicator value of species in the ground flora, and gives 16 examples of its application. Symbols are allotted for separate scales of values in three broad classes of site factor—viz. water régime, soil nutrient status, and humus or acidity types—as indicated by the plant species. In the tabulated species list for a given community the appropriate symbols are written against each species and are weighted with a figure expressing the degree of cover (relative abundance and dominance) of that species. The same figure is applied to the proper symbol in each of the three site-factor classes, so that the weight is identical for each class. By taking the total weight for each distinct symbol in the list, irrespective now of species, and tabulating the results, the site spectrum is obtained. For ready comparison of different site spectra it is best to express the results in %, and it is also simple and convenient to represent them in the form of histograms. Such spectra are not rigidly bound to any particular system of plant sociology and should be useful aids to ecological and silvicultural studies.

30. FAEGRI, K. Bedømmelse av lyngmark for granplanting. **[Determining the suitability of heathland for planting Norway Spruce.]** *Tidsskr. Skogbr.* 60 (4/5), 1952 (99–103). [Nor.]

The vegetation from 37 heath types was analysed in an attempt to find plants indicating whether sites are suitable for Spruce. Thirteen species were found to be characteristic of different site types; of these, *Arctostaphylos uva-ursi*, *Antennaria*, *Arnica*, *Hieracium*, *Lotus corniculatus*, *Lathyrus montanus*, *Pteridium aquilinum* and *Scabiosa succisa* were found on good Spruce sites. Heathland where one or more of these species is abundant (1/sq. m.) and the other species are present at a rate of at least 4/10 sq. m. and the top layer of soil is not peaty, is suitable for Spruce so long as the site is neither too dry nor too windy. Raw-humus sites are suitable for Spruce if the other conditions are fulfilled, and especially if there is an abundance of *Lotus corniculatus*, *Lathyrus montanus* or both. The presence of *Myrica gale* is not in itself an indication of the quality of the site: if the plants already mentioned, especially *Pteridium* are present, the site may be suitable, but if *Vaccinium uliginosum*, *Cornus suecica*, *Erica tetralix*, *Scirpus germanicus*, and *Narthecium* are present, it is unsuitable. *Sphagnum* indicates a poor Spruce site. Other mosses have no significance as indicators. The presence of lichens in large

numbers on heathland indicates, on the whole, sites unfavourable to Spruce.

31. MRÁZ, K. Degradačni stadia lesních typů. [**Degradation stages of forest types.**] *Lesn. Práce* 29 (9/12), 1950 (357–84). 15 refs. [Cz.russ.e.]

Results of an investigation carried out in the Smetana forest (Choceň district, Bohemia). The forest belongs to the *Querceta*, which are worst affected by degradation from the unsuitable Spruce stands (in some places in their second rotation) that have been established there. Altitude range is 268–324 m., average annual rainfall 622 mm., average temperature 7·8° C., bedrock chalk, with marly clay soils, terraces of loamy sand and stretches of alluvium. The original association, before plantations were started, seems to have been largely the *Acereto-Fraxinetum*. Pine was introduced along with the Spruce to the detriment of Oak and other hardwoods, and shows good growth even now. Spruce, however, gives a poor yield, besides degrading the site. Relationships between soils, forest types as indicated by ground vegetation, and forest site quality are examined, using data collected during field work for revision of the working plan. The relationships between the actual communities representing degradation stages, and the probable original forest types (classified for comparison by 3 different systems—Sukačev, Cajander, and Klika) on the 4 parent materials (alluvium, sandy loam terraces, terraces on clay, marly clay) are tabulated. Another table shows the average site quality of Pine and Spruce for single units for the 4 parent materials and the ground vegetation and the types indicating degradation stages. The results are then discussed from the points of view of the science of forest types, silviculture and economic significance.

32. JOHNSTON, E. J. **The morphology and evolution of the soils of 'Pine Lodge' Estate, New South Wales.** *Bull. Commonw. sci. industr. Res. Organ. Aust.* No. 259, 1950. pp. 32 + soil map etc. 12 refs.

Murray Pine (*Callitris propinqua*), which is usually regarded as an indicator of coarse-textured soils, is ubiquitous in this area, apparently because a slightly higher and better distributed rainfall permits it to grow on a greater variety of soils.

114.6. Soil Biology

33. ŠILOVA, E. I. K biologičeskoĭ harakteristike profilja podzolistoĭ počvy. [**Biological characteristics of the podzol soil profile.**] *Počvoved.* 1951 (9), (536–48). 22 refs. [Russ.] A.P.B.

Reports on investigations in autumn 1948 and in early July, early September, and early October 1949, on the microbiology of two varieties of podzol in Leningrad Province. Both areas carried mixed Spruce, Birch, and Aspen, 20–30 years old, with some Alder underwood and considerable numbers of half-rotted stumps. In both areas samples were taken from under dense groups of Spruce with no ground flora, and results obtained were similar. The main mass of roots and the microflora and microfauna were almost confined to the lower A_0 and upper A_1 horizons; acidity was highest in the lowest, most decomposed portion of the humus layer, which was the zone of maximum root concentration (and consequently of intensive absorption of bases by the roots). This level also carried the highest numbers of microflora and microfauna. The middle portion of the A_0 horizon, immediately below the undecomposed litter, was matted together with fungal hyphae; below this level, fungi decreased rapidly. Bacteria, on the other hand, showed maximum populations in the lower, more humified A_0 and the upper A_1 horizon. Of the microfauna, the Acarina were found chiefly in the middle portion of the A_0 horizon. At 0–0·5 cm. one species each of *Oribates* and *Gamasides* occurred in small numbers; at 0·5–2 cm. several species of *Oribates*, *Gamasides*, *Tyroglyphoidea* and others; at 2–5 cm. the mite population was extremely high, but consisted almost entirely of one species of *Oribates*; and at 5–10 cm. numbers declined rapidly, and only one species, an *Oribates*, was found. Enchytraeidae were most numerous in the lower A_0 and upper A_1 horizons, to which they were practically confined. Apterygota were at a maximum from the middle to the bottom of the A_0 horizon, but were also more numerous than any other group in the lower horizons down to A_2, in which they decreased rapidly. Data are given only for the groups named, as it was not possible to make closer identifications during the work. The animal populations showed a great increase, and the bacteria a tendency to decrease in numbers, in late summer to autumn.

114.7. Soil Surveys and Surveying

See Nos. 27–8, 32.

116. *Hydrology. Soil and Water Conservation and Erosion*

See also Nos. 13, 66–7, 159, 217, 224, 314–21, 324, 390, 545.

34. MUNNS, E. N. **Yield and value of water from Western national forests.** *J. For.* 50 (6), 1952 (464–8).

Presents and discusses data on precipitation and run-off from national-forest areas in the 11 western states of the U.S.A. Figures for adjacent unforested areas are in each case given for comparison.

35. SMITH, J. L., and CRABB, G. A., JR. **Progress report on the wooded watershed of the Michigan hydrologic research station.** *Quart. Bull. Mich. agric. Exp. Sta.* 34 (4), 1952 (383–94).

The lay-out of the experiment and the instruments used are described. Preliminary data showed that two catchment areas mainly arable lost more than 31,000 and 56,000 lb. soil/acre respectively in the first 11 years of the project, whereas a comparable forested watershed lost only 62 lb./acre. Run-off from the same areas in the same period was 50 in., 44·48 in., and 5·96 in. respectively—an important difference in a region with mean annual rainfall of only 31·43 in. Soil temperatures were generally more stable in the wooded catchment area.

36. GARNIER, B. J. **A simple apparatus for measuring potential evapotranspiration.** *Nature, Lond.* 170 (4320), 1952 (286–7). 2 refs. [University College, Ibadan, Nigeria.]

37. Labunskiĭ, I. M. Veliko-Anadoljskiĭ les i 'mertvyĭ gorizont'. **[The Veliko-Anadol' forest and the 'dead horizon'.]** *Agrobiologija* 1950 (4), (138–42). [Russ.] A.P.B.

Tabulates moisture determinations from deep soil borings in this old steppe plantation area [cf. *For. Abstr.* 11 (No. 294).] to disprove the notion that steppe plantations are bound to fail through creating a 'dead-horizon' 3–4 m. or more deep, exhausted of water by their roots and beyond the reach of water derived from direct precipitation. Concludes that, on the contrary, after afforestation the subsoil became permeable right down to groundwater level; and that with the elimination of surface run-off the subsoil moisture depends more on the total than on the seasonal distribution of precipitation.

38. Zonn, S. V., and Mina, V. N. Zapasy vlagi v lesu i stepi. **[Moisture supplies in forest and steppe soils.]** *Dokl. Akad. Nauk SSSR* 67 (4), 1949 (733–6). 7 refs. [Russ.] A.P.B.

Gives some results of soil-moisture determinations in 150- to 170-year-old Oak forest and open steppe in the Tellerman Forest, Voronezh, on dark-grey, feebly podzolic, solonets and degraded chernozem soils. Results show that moisture is more uniformly distributed in the forest soil profile than in the steppe. During the growing season the former becomes drier at depths exceeding 100–110 cm., whereas in the latter it is the surface 1-m. layer that dries out. Under forest, the moisture supply is replenished annually by the start of the growing season, despite some drainage away in the soil. Samples on a felled area in the forest showed somewhat greater drying out than under canopy, resulting probably not only from higher evaporation but also from the movement of soil moisture to the soil under the surrounding forest. The replenishment of moisture supplies under forest is attributed to the high infiltration capacity of the forest soil (in tests, this soil absorbed 18 cm. of water per hour as compared with only 2–3 cm. for the dry field soil). The forest soil was moister at all times in the top 1–1·5 m. than field soil of the same texture: the water stored deep in spring keeps the top soil moist in summer and assists in enabling it to absorb summer rainfall that would be lost on the fields.

39. Wind, R. Verslag van een onderzoek naar de invloed van de vegetatie op de kwaliteit van het duin water. **[Report on an investigation of the influence of vegetation on the quality of dune water.]** *Meded. Inst. toegep. biol. Onderz. Nat.* No. 12, 1952. pp. 127 + 6 photos + 2 dgms. + 7 gphs. + 6 tbls. Many refs. [Du.du.e.f.]

The investigation was made by displacing the water retained in the soil above the capillary zone from (1) dune sand placed in concrete trays or sewer pipes, covered with different kinds of litter, and exposed to rain or watered, and (2) samples taken at monthly intervals for 18 months, using steel tubes, under Pine woods and Oak woods on dunes, and under natural low dune vegetation, from depths of 0–1 and 1–2 m. The water used to displace the retained water contained fluorescein as an indicator. Underground water from under Pine woods and bare dunes was also sampled monthly. Results include the following: (1) A thick cover of Pine needles or Oak leaves increased the content of organic matter and the colour of the seepage water, but the quantity of organic matter in it decreased with increasing depth of the sand layer below the litter. (2) Damaged Oak roots coloured the water yellow. (3) Water from an Oak wood with an undergrowth of Elder had a high organic content. (4) Values for colour, organic matter, HCO_3 ions, hardness and chloride content, were higher for soils under Pine or Oak than for those under low dune-vegetation. (5) Higher values for colour and organic matter were found for retained water from Oak than from Pine woods, but for hardness and chloride content higher values were obtained from Pine woods. (6) pH values of water from Pine woods did not differ materially with different thicknesses of litter. (7) Analysis showed the unfavourable effects on water of Pine woods as compared with bare dune areas. (8) A comparison of the moisture content of the top soil layer of areas with low dune-vegetation, Pine woods, and Oak woods showed that: (*a*) the m.c. in Pine woods, lower in spring and summer than in areas with dune vegetation, increased rapidly during the autumn, reaching in winter a higher value than in the latter areas; and (*b*) a lower m.c. in spring in Oakwoods increased slowly till June, fell till August and then increased to become higher than that on the low dune-vegetation areas during winter. (9) Underground water in one Pine wood always showed a higher content of chlorides than that from a bare dune area in the same district. Quantitative records of precipitation in and outside another Pine wood showed that at some points in the wood a larger quantity of chlorides penetrates into the soil with the rain water than elsewhere in the wood or outside in an area with low vegetation. (10) No relationship between Fe content and vegetation could be established. (11) Nitrate contents varied too much for any conclusions to be drawn, but were noticeably high in retained water from the Oak wood with Elder. (12) Retained water and underground water from wooded areas were harder than that from low vegetation areas. [Cf. *For. Abstr.* 14 (No. 224).]

40. Weitzman, S., and Trimble, G. R., Jr. **Skid-road erosion can be reduced.** *J. Soil Wat. Conserv.* 7 (3), 1952 (122–4). [Northeastern Forest Experiment Station.]

A study of erosion on different types of skid road was made in the Fernow Experimental Forest (W. Va.). The preliminary results indicate that erosion can be controlled by limiting the gradient and installing water bars to conduct water off the road. The necessary mileage of skid roads can be much reduced by careful planning.

41. Plateau. Le Haouz de Marrakech et le Haut-Atlas. **[The Haouz of Marrakesh and the Great Atlas.]** *Rev. for. franç.* 1952 (6), (381–98). [F.]

Describes the types of soil erosion occurring in both regions, the necessity of controlling run-off from the mountains in order to protect the plains, and control measures already taken.

42. Acosta Solis, M. Especies botánicas para la protección del suelo contra la erosión. **[Species**

suitable for the protection of soils against erosion.] *Contribución, Instituto Ecuatoriano de Ciencias Naturales, Quito* No. 20, 1952. pp. 17 + 4 photos. [Span.]

A list of species (mainly Gramineae and Leguminosae) suitable for (1) the coastal regions, and (2) the highlands of Ecuador.

14. SYSTEMATIC ZOOLOGY

145.7. Insecta. Entomology

See also Nos. 472 *et seq.*, 784 *et seq.*

43. GRIFFIN, F. J. **A bibliography of the Isoptera (termites) 1758–1949.** *Journal of the Society for the Bibliography of Natural History, London* 2 (8), 1951 (261–368). Price 15*s.* O.R.S.

44. STRAWIŃSKI, K. Powiązanie biologiczne pluskwiaków (*Hem.-Heter.*) z roślinnością drzewiastą. [**Biological association of *Hemiptera-Heteroptera* with woody plants.**] *Ann. Univ. M. Curie-Skłodowska, Lublin* 5*C* (2), 1950 (65–87). 40 refs. [Pol.russ.e.] L.S.

Lists 117 species that may be classified as permanent tree-dwellers, and the tree species on which the particular insects have been found in Poland, indicating the most important hosts.

45. JOHNSON, C. G. **A new approach to the problems of the spread of aphids and to insect trapping.** *Nature, Lond.* 170 (4317), 1952 (147–8). 14 refs.

Reviews current views and research work on aphid migration, and points out some problems connected with trap data in dealing with aphids and other insects where rapid, large population changes contribute more to changing numbers than do variations in flight behaviour.

46. ERMIN, R. Untersuchungen zur Honigtau- und Tannenhonigfrage in der Türkei. [**Studies on the question of honeydew and 'Fir honey' in Turkey.**] *Repr.* from *Istanbul Üniversitesi Fen Fakültesi Mecmuası* (*Seri B*) 15 (3), 1950 (185–224 + 11 photos). 96 refs. [G.g.turk.]

Honey formed from the honeydew of *Cinara pichtae* on *Abies bornmülleriana* plays an important rôle in Turkish bee-keeping. The process of formation is described and the direct and indirect effects on *Cinara* of the other insect population of *A. bornmülleriana*. Chemical analysis of *Cinara* honeydew and the resulting honey, of Turkish origin, revealed the presence of protein, which has not hitherto been noticed in the literature on the subject. The possible use of this source of honey by the nomadic beekeepers of the Anatolian forests is discussed.

47. HACKMAN, R. H., and TRIKOJUS, V. M. **The composition of honeydew excreted by Australian coccids of the genus *Ceroplastes*.** *Biochem. J.* 51 (5), 1952 (653–6). 28 refs. [Division of Entomology, C.S.I.R.O., Canberra.] O.R.S.

The honeydews of *C. destructor*, *C. ceriferus* and *C. rubens* from different plants, including Citrus trees, *Bursaria spinosa* and *Mangifera* sp., were found to contain ribitol. Ribitol was also found in twigs of Lemon, Sweet Orange and *Eugenia luehmanni*, and in the honeydew of *Saissetia oleae* growing on Sweet Orange and of *Eriococcus eucalypti* on *Bursaria spinosa*. It was not found in honeydew of *E. coriaceus* growing on the twigs of *Eucalyptus globulus* var. *compactus* nor in the twigs of this species.

15. ANIMAL ECOLOGY (INCLUDING GAME AND FISH MANAGEMENT, HUNTING, SHOOTING AND FISHING)

See also Nos. 224, 459 *et seq.*, 478.

48. LAWRENCE, W. H. **Evidence of the age of Beaver ponds.** *J. Wildlife Mgmt.* 16 (1), 1952 (69–79). 6 refs. [University of Michigan, Ann Arbor.] B.A.P.

A study was undertaken in 1948 to determine the relationship between beaver and forest vegetation on the headwater streams of the East Branch of the Ontonagon River in Iron and Houghton Counties, Michigan, in the course of which it was necessary to determine the age of beaver ponds, and the periods of their occupation. The methods used were: (1) study of the annual rings of trees in cross-sections and increment borings, yielding evidence on callus growth, coppice growth, release of conifers by removal of an Aspen overstorey, fluctuations in the marginal woody vegetation of abandoned ponds, and flooding and its effects on the conifers; (2) a study of evidence from supplementary sources, viz. land office survey notes, timber cruise reports, stream surveys, and aerial surveys. The methods of collecting and interpreting such data are described.

49. DAVIS, D. H. S. **Notes on the status of the American grey squirrel (*Sciurus carolinensis* Gmelin) in the south-western Cape (South Africa).** *Repr.* from *Proceedings of the Zoological Society, London* 120 (2), 1950 (265–8). 2 refs. B.A.P.

Notes on the spread and present distribution of *S. carolinensis*, introduced shortly after 1900. Chief limiting factor in its spread is the absence of tall seed-bearing trees. Dreys are built high in the branches of the following trees, listed in approximate order of frequency: *Pinus pinea, P. canariensis, P. pinaster, P. halepensis, Eucalyptus* spp., *Acacia saligna, Olea verrucosa, Populus canescens* and others.

50. PRACY, L. T., and KEAN, R. I. **The opossum in New Zealand (habits and trapping).** *Wildlife Branch Bulletin, New Zealand Department of Internal Affairs, Wellington* No. 1, 1949. pp. 19. B.A.P.

Details of the life history of *Trichosurus vulpecula* with data on its food habits collected from field observations, experimental feeding in captivity, and stomach analyses. A list of preferred species is presented, giving the part of the plant taken. Data from the Orangorango district show that selective feeding by opossum will eventually alter the composition of the bush in the Orangorango Valley. The paper also includes sections on the effects of opossum populations on bird life, and methods of trapping and skinning.

51. POOLE, A. L. [Editor]. **Preliminary reports of the New Zealand-American Fiordland expedition. Investigations in Fiordland, New Zealand, in 1949.** *Bull. Dep. sci. industr. Res. N.Z.* No. 103, 1951. pp. 99 + 1 map. 39 refs. Price: 7*s.* 6*d.* X.

The expedition was organized to study the *Cervus canadensis* populations in the Fiordland National Park. The report contains studies of the feeding habits of deer (both *C. canadensis* and *C. elaphus*) from field observations (*A. L. Poole* and *J. T. Holloway*) and from analyses of stomach contents (*R. Mason*), and also a comparison of the food habits of *C. canadensis* in New Zealand and in America (*O. J. Murie*). Also included are sections on the vegetation of the area (*A. L. Poole et al.*) and a forest survey (*J. T. Holloway*).

52. **Our deer problem.** *Pennsylvania Game News, Harrisburg* Spec. No. 1, 1951. pp. 48. B.A.P.

This number is devoted to studies of questions affecting the deer herds of Pennsylvania, and contains a series of articles on the life history of the deer, and problems affecting their management. Particular reference is made to food habits, overbrowsing by the herds, which are at present swollen in numbers, and the effects of these large numbers on the forests and on the deer herds themselves.

53. HARNEY, J. E. **Meal tickets.** *Pennsylvania Game News, Harrisburg* 22 (8), 1951 (39–42). B.A.P.

A study of deer browse was made on two areas in *Quercus montana* forest in Pennsylvania, one area clear felled and the other submitted to thinnings according to the selection system. Results showed that 10 acres clear felled would produce sufficient browse to supply 50 deer throughout the winter months of 1 year; 10 acres of thinned forest would support 3 or 4 deer, while untreated forest would support only 1 deer for the same period.

54. SMITH, J. G. **Food habits of Mule deer in Utah.** *J. Wildlife Mgmt.* 16 (2), 1952 (148–55). 16 refs. B.A.P.

Seasonal forage habits of *Odocoileus hemionus* were studied. About 125 species were used, but the bulk of the seasonal diets consisted of 8 species or fewer. Forbs were preferred so long as they remained succulent. Woody species figuring largely in the summer diet were *Populus tremuloides*, *Prunus virginiana*, *Quercus* spp. *Symphoricarpos* sp., and *Sambucus glauca*. On the winter range *Artemisia tridentata*, *Cowania stansburiana* and *Purshia tridentata* provided more than $\frac{4}{5}$ of the total diet.

55. BARICK, F. B. **The edge effect of the lesser vegetation of certain Adirondack forest types, with particular reference to deer and grouse.** *Roosevelt Wildlife Bulletin, Syracuse* 9 (1), 1950. pp. 146 + 1 map + 1 tbl. 69 refs. B.A.P.

A study was made of the vegetational characteristics of certain forest edges, and a graphical and mathematical analysis is presented of the wildlife habitat potentialities of 10 forest types as compared with the edges between these types. The methods of analysis are presented in detail. The results, which are also given, are limited in their dependability owing to lack of knowledge of the habitat requirements of deer and grouse for this region.

56. BOLDT, W., and HENDRICKSON, G. O. **Mourning dove production in North Dakota shelterbelts, 1950.** *J. Wildlife Mgmt.* 16 (2), 1952 (187–91). 4 refs. B.A.P.

The shelterbelts studied had centre rows of *Ulmus pumila* and *Populus deltoides* reaching a height of about 30 ft. The edge rows consisted of *Elaeagnus angustifolia*, *Prunus virginiana*, *P. americana*, *Syringa vulgaris* and *Lonicera* spp. Intermediate trees between the centre and edge rows were *Fraxinus pennsylvanica* var. *lanceolata* and *Ulmus americana*. Nesting began about 15 May and continued until about 25 September, reaching a peak during the week 13–19 August. Trees preferred for nesting were *U. pumila*, *U. americana* and *E. angustifolia*. About 4 pairs of doves nested to a mile of shelterbelt, producing about 15 doves per mile.

16. GENERAL BOTANY

160. *Plant Chemistry*

See also Nos. 18, 20, 61, 68, 90, 411, 436, 653 *et seq.*, 866–75, 877–8.

57. MUSGRAVE, O. C., and WAGNER, H. M. **The triterpenoids of *Alstonia verticillosa*.** *J. chem. Soc.* July, 1952 (2937). 3 refs. [Royal Technical College, Glasgow.] O.R.S.

58. MUKERJEE, S. K., and MURTY, V. V. S. **Chemical examination of the flowers of *Acacia leucophloea* Willd.** *J. sci. industr. Res., India* 11*B* (3), 1952 (125–6). D.S.I.R.

59. ICE, C. H., GAGE, T. B., and WENDER, S. H. **The isolation of flavonoid glycoside from *Gleditsia triacanthos*.** *Proc. Iowa Acad. Sci.* 31, 1950 (1951), (137–8). 2 refs. A.P.B.

Describes the laboratory experiments by which the glycoside was isolated from the green pods.

60. GAGE, T. B., DILLAHA, J., and WENDER, S. H. **Preliminary studies on a flavonoid pigment from the fruit of *Platanus occidentalis*.** *Proc. Iowa Acad. Sci.* 31, 1950 (1951), (138–40). A.P.B.

161. *Physiology*

See also Nos. 9, 101–2, 160, 165, 167–8, 174–5, 410–1, 436, 627, 777.

61. **Annual review of plant physiology.** Annual Reviews Inc., Stanford, Calif. No. 3, 1952. pp. 369. Many refs. Price $6·00.

Includes the following review articles, containing references to many forest species: Factors affecting availability of inorganic nutrients in soils with special reference to micro-nutrient metals (*G. W. Leeper*); Glycolytic enzymes in higher plants (*P. K. Stumpf*); Metabolism of phosphorylated compounds in plants (*H. Albaum*); Studies of the physiology, pharmacology and biochemistry of the auxins (*J. Borner* and *R. S. Bandurski*); Agricultural application of growth regulators and their physiological basis (*J. van Overbeek*); Transport of organic compounds (*W. H. Arisz*); Leaf proteins (*S. Wildman* and *A. Jagendorf*); Physiological aspects of low-temperature preservation of plant products (*M. A. Joslyn* and *H. C. Diehl*); Physiology of virus diseases (*F. C. Bawden* and *N. W. Pirie*); Mechanisms of ion absorption by roots (*R. Overstreet* and *L. Jacobson*); Physiological bases for assessing the nutritional requirements of plants (*A. Ulrich*); Photosynthesis

(*E. Rabinowitch*); Physiology of flowering (*A. Lang*); Carboxylating enzymes in plants (*B. Vennesland* and *E. E. Conn*); Tree physiology (*B. Huber*).

62. NAKAYAMA, J. **The effects of aeration on hydroponics of trees.** *Bull. Kyoto Univ. For.* No. 18, 1950 (97–113). 6 refs. [Jap.e.]

In tests to determine the amount of O_2 required by tree seedlings grown by the hydroponic system, the following results were obtained: (1) There is no difference between Shibamoto's solution and Olson's solution (formulations given) for the growth of *Chamaecyparis obtusa*, but Shibamoto's solution gives rather better results for *Acacia dealbata* and Olson's solution is unsuitable for *Pinus densithunbergii* Uyeki. (2) The amount of O_2 in solution was lowest at about the end of September and 12 October for *C. obtusa* and *A. dealbata* respectively, if the effect of the density of the air and the solubility of the O_2 at the time of aeration are eliminated. (3) The various degrees of aeration, carried out twice a day at volumes from 250 to 2000 c.c., had little effect on the top growth of *C. obtusa* but considerable effect on root growth; the growth of the main root decreased and the number of roots diverging from the upper part of the main root increased with decreasing volume of aeration, particularly at volumes below 500 c.c. (4) Both top and root growth of *A. dealbata* increased with the volume of aeration, volumes over 2000 c.c. giving satisfactory results. (5) When Pines are transplanted to the nursery new roots are formed and the old roots appear to stop their growth. No clear relationship could be found between aeration and root growth. (6) *A. dealbata* showed a higher consumption of O_2 per single seedling than *C. obtusa*, and growth increased with O_2 consumption.

63. DIMBLEBY, G. W. **The root sap of Birch on a podzol.** *Plant & Soil* 4 (2), 1952 (141–53). 2 refs.

Root-sap analyses were made on Birch trees growing in a strongly podzolized heath soil. In the early summer the concentration of Ca and P appears to vary with the quantity of sap produced, and is independent of root environment. Later in the summer, however, this relationship no longer holds, there now being a connexion between rooting zone and nutrient concentration. Roots reaching the C horizon absorb greater quantities of bases, whilst the superficial roots show higher concentrations of P and ammoniacal N. Throughout the season, K uptake remains practically independent of both sap yield and rooting zone. In these soils young Pine trees do not penetrate to the subsoil, but a comparison of sap analyses from surface roots of Pine and Birch shows that Birch sap is richer in most nutrients. This, together with the ability of the Birch to exploit the subsoil, may be a contributory factor to the soil-improving properties of a Birch crop. [Cf. *For. Abstr.* 10 (No. 2442).] *Author's summary.*

64. MARVIN, J. W., and GREENE, M. T. **Temperature-induced sap flow in excised stems of *Acer*.** *Plant Physiol.* 26 (3), 1951 (565–80). 24 refs. (*Journal Series Paper Vermont Agricultural Experiment Station* No. 14.) O.R.E.

The response of cut stems of *A. saccharum* to various treatments at controlled temperatures was studied. The flow from different stems, or from sections of the same stem under the same temperature conditions, differed widely in quantity and may even differ in quality. Freezing is not necessary to induce the flow, since a second flow of sap may be induced by raising the temperature after a flow at a lower temperature. Flows were produced from stems perfused with sap from other trees, or with a sucrose solution. The direction of the movement, however, was reversed when the stems were perfused with distilled water or a mannitol solution isosmotic with the sucrose content of normal sap. The composition of the vessel sap, therefore, seems to have a profound influence on the flow mechanism. Treating the stems with steam and, presumably, inactivating the living cells, also reversed the direction of the movement in the vessels. The experiments show clearly that thermal changes in the physical systems alone are not sufficient to account for the differences in flow observed.

65. TRANQUILLINI, W. Der Ultrarot-Absorptionsschreiber im Dienste ökologischer Messungen des pflanzlichen CO_2-Umsatzes. **[Infra-red absorption recording instrument used for ecological measurements of the CO_2-exchange of plants.]** *Ber. dtsch. bot. Ges.* 65 (5), 1952 (102–12). 14 refs. [G.g.] O.B.D.

Describes field experiments with Birch, Beech and Spruce in which the apparatus proved fully satisfactory.

66. IVANOV, L. A., SILINA, A. A., ŽMUR, D. G., and CELJNIKER, JU. L. Ob opredelenii transpiracionnogo rashoda drevostoem lesa. **[The determination of the transpiration loss of a forest stand.]** *Bot. Ž.* 36 (1), 1951 (5–20). 20 refs. [Russ.] C.G.B.

Preliminary work by Ivanov at Borovoe, Akmolinsk district, Kazakhstan, in 1942–3, had established a close correlation between air temperature and the transpiration rate of Pine and Birch under natural conditions. Since 1946 the author and his collaborators, working in the Serebryanny Bor experimental forest, Moscow Province, have concentrated upon the perfection of their rapid weighing method of determining transpiration [see *For. Abstr.* 12 (No. 1748)] and the development of a 'thermogravimetric' method for estimating the transpiration of forest stands per ha., to which the present paper is devoted.

The data presented are based on over 6000 determinations made at intervals throughout the growing season (end of June–1 October), air temperatures also being recorded, of the transpiration rates of 17 tree and shrub species recommended for shelterbelts, viz. *Acer negundo*, *A. platanoides*, *A. tataricum*, *Betula* [*verrucosa*?], *Corylus avellana*, *Fraxinus excelsior*, *Euonymus europaeus*, *Lonicera* sp., *Pinus sylvestris*, *Populus berolinensis*, *P. suaveolens*, *P. tremula*, *Pyrus malus*, *Quercus robur*, *Sambucus* [*nigra*?], *Sorbus aucuparia*, *Tilia* sp., and *Ulmus* sp. The greatest number of determinations for a single species were made on *P. sylvestris*. Some determinations were made on ca. 10-year-old Pine and Birch, and on *A. negundo* and *A. platanoides*, in the nursery; others, in a Pine wood with an understorey of hardwoods and undergrowth of

shrubs; and in two cases—*P. malus* and *F. excelsior*—the trees were open-grown. Ages for the last two groups [not individually specified] ranged from 10 to 60 years. The samples for weighing were normal, healthy 1-year shoots bearing adult, healthy leaves. Results are tabulated to show that, using the means of all observations, the correlation coefficients for transpiration as related to air temperature are positive, lying with one or two minor exceptions between 0·68 and 0·98, and indicating a direct proportionality for the region and conditions represented (4–29° C.; adequate soil moisture) From these experimental data, a regression equation is deduced for each species, expressing the mean transpiration (in mg./g. fresh leaf weight/hour) for any temperature within ranges indicated separately for the individual species. Values so calculated for each species are given in a table, and further tables compare these values with the mean of experimental data for individual days and the averages for a series of individual days. For the means of 3–8 individual days the differences from calculated values vary from $\pm$ 3 to $\pm$ 18%, but for the means of 30 days the differences never exceeded $\pm$ 6%.

The temperature readings used were taken at clock times of 7, 13 and 19 hours. Where such data are not available, however, it is still possible to use the records of meteorological stations—suitably corrected, since they do not refer to the daily transpiration period accepted by the authors, whose observations (not detailed) indicate for the Moscow region the following average daily duration of transpiration (clock times in brackets): May 10 hr. (8–18); June 12 hr. (7–19); July 11 hr. (8–19); August 9 hr. (9–18); September 7 hr. (10–17). Corrections to the mean monthly temperatures published by the meteorological stations are worked out for the region and tabulated. Using these data and assuming the transpiration season of Pine to be the period with monthly mean temperature $> 5°$ C. and that of the hardwoods to be 1 June–1 October, a calculation is made of the number of transpiration hours in the growing season for each of the species and the corrected mean temperature of the season, from which the seasonal transpiration per g. fresh leaf weight—termed the 'transpiration number'—is computed from the regression equations. To get the transpiration of a stand per ha. the transpiration number must be multiplied by the fresh leaf weight per ha. of the species concerned. The latter is troublesome to determine and is very variable with age, site quality, stand density etc. For Larch, Russian data exist which can be used to find leaf weight from c.a.i. and stem diameter, and some prospect of a similar correlation exists also for Pine [cf. *For. Abstr.* 14 (No. 177)]. If further work should enable leaf weight to be determined from such relationships in the other species, calculations of transpiration by this method would be much simplified. Meanwhile the authors have obtained some leaf-weight data for Pine (10, 33, 65, 80 and 150 years old) and Birch (25, 60 and 70 years old) with which they estimate the corresponding transpiration/ha. for the whole transpiration season. A few figures obtained by Molčanov by measurements of the soil-water balance are available for comparison; these and the figures obtained by the present method show differences of 2–12%.

Emphasis is laid in conclusion upon the preliminary nature of the work and the need for comparison with results obtainable by other methods.

67. Ivanov, L. A., and Silina, A. A. Ob aktinometričeskom metode opredelenija transpiracii lesa. [**An actinometric method of determining the transpiration of forest.**] *Bot. Ž.* 36 (5), 1951 (517–22). 15 refs. [Russ.] C.G.B.

The amount of solar radiation energy absorbed by the foliage (tree crowns) is $q_a = Q - q - q_1$, where Q is the sum of direct and diffuse radiation in the open, q is the energy reflected by the crowns, and q_1 is the energy that passes through the crowns. Further, the energy q_a is used by the crowns for (1) photosynthesis, (2) heating of the surrounding air (if it is colder than the leaves), and (3) transpiration. (1) consumes an insignificant fraction of the incident energy, and may be neglected. A review of available data suggests that the energy lost or gained by (2) is also very small compared with that expended in (3). Hence q_a may be taken as an approximation to the energy used in transpiration; and this, divided by the energy required to evaporate one unit of water at a given (air) temperature, will give the amount of water transpired. Q values are quoted for the Moscow region, as monthly totals for July–September and the grand totals for the 4 months. Values for q and q_1 were estimated from special actinometric measurements made in the Serebryanny Bor and the experimental forest of the Timiryazev Agricultural Academy, in 10- and 80-year-old Pine and 60- and 77-year-old Birch stands. The q values were estimated from measurements of reflection from continuous masses of foliage on the lateral margins of stands under different conditions of cloud and sun, the figures so obtained (8% for Pine and 15% for Birch) being halved to give probable vertical reflection from the canopy (this ratio having been previously determined from the air for mature Spruce stands). The q_1 values were deduced from simultaneous measurements inside and outside the stands, with a reduction for the amount of energy absorbed by branches and twigs. The last was obtained for the 10-year-old Pine by measurements before and after stripping the needles from the crowns on a sample plot, and the same figure was applied to correct the data for the 80-year-old Pine. For the two Birch stands the correction was based on the mean of spring and autumn measurements in the leafless state. A table compares the transpiration values obtained by this and by the 'thermogravimetric' method [cf. preceding abstract] for the same stands. The actinometric method gave figures respectively 8·1 and 1·2% higher for the two ages of Pine, and 14·5 and 23·8% lower for those of Birch, than the thermogravimetric. The quite probable values for Pine suggest that the new method should be applicable to other conifers under conditions of adequate water supply. In the case of Birch it is believed that the difference between the results—those obtained by the 'thermogravimetric' method being assumed to be fairly accurate—indicates that some of the energy used in transpiration

may be derived from another source, e.g. as heat from warmer air surrounding the leaves—a possibility which is supported by older work (H. T. Braun and F. Escombe, *Proc. Roy. Soc. Lond.* 1905).

68. Lisicyn, D. I. O roli labiljnyh gljukozidov v rastenijah. [**The rôle of labile glucosides in plants.**] *Biohimija* 17 (3), 1952 (320–8). 24 refs. [Russ.russ.] E.M.B.

Gives analytical data for leaves of *Syringa vulgaris* and *Fraxinus excelsior*, including data on the variation in content of sugars throughout the day, and discusses the physiological relationships involved.

69. Gremmen, J. **A preliminary study on the culture of *Discomycetes* especially the perfect stage.** *Repr.* from *Antonie van Leeuwenhoek, Amsterdam* 18, 1952 (153–64). 22 refs. [E.e.] [Forest Research Station T.N.O., Wageningen.]

Of 40 species studied *in vitro*, only 6 produced apothecia.

70. Hepting, G. H., Toole, E. R., and Boyce, J. S., Jr. **Sex and compatibility in the Oak wilt fungus.** *Plant Dis. Reptr.* 36 (2), 1952 (64). 4 refs. A.P.B.

Isolates of *Chalara quercina* from 29 trees in several states of the U.S.A. proved to be self-sterile hermaphrodites, and of two types with regard to compatibility, i.e. the conidia from one type fertilize the thallus of the other, and will produce fertile perithecia in as little as 3 days.

71. White, I., and Wolf, F. T. **Preliminary report on some nutritional requirements of *Chalara quercina*.** *Abstr.* in *Phytopathology* 42 (5), 1952 (288).

Some of the nutritional requirements of *C. quercina* were determined in a preliminary way. In a synthetic medium containing dextrose as the source of C, $(NH_4)_2SO_4$ as the source of N, and McIlvaine's citric acid/Na_2HPO_4 buffers, the optimum pH for growth was found to be approximately 4·0. The optimum and maximum temperatures for growth are 20–23° and 30° C., respectively. *C. quercina* can utilize $(NH_4)_2SO_4$ and a variety of amino acids as sources of N, but cannot utilize nitrate N. Aspartic acid, glutamic acid, arginine, asparagine, proline, alanine and ornithine, were superior to other amino acids tested as sole sources of N. The level of free amino acids tolerated by *C. quercina* is rather low, and there are indications that cystine and perhaps other amino acids are quite toxic to the organism. Of 22 carbohydrates tested, only *d*-arabinose and rhamnose were not utilized. Dextrose, levulose, sucrose and cellobiose were the best of the C sources tested.

72. Fåhraeus, G. **Formation of laccase by *Polyporus versicolor* in different culture media.** *Physiol. Plant., Copenhagen* 5 (2), 1952 (284–91). 7 refs. [E.e.]

Cf. *For. Abstr.* 13 (No. 3571).

163. *Embryology*

73. Pal, N. **On the embryology of *Terminalia catappa* Linn.** *Sci. & Cult.* 17 (4), 1951 (178–9). 3 refs. E.M.B.

164. *Morphology*

See also Nos. 84, 122, 132.

74. Griffith, M. M. **The structure and growth of the shoot apex in *Araucaria*.** *Amer. J. Bot.* 39 (4), 1952 (253–63). 39 refs. O.B.D.

75. Kudrjavcev, K. A. O zavisimosti dliny bokovyh pobegov obyknovennoï sosny (*Pinus silvestris* L.) ot ih sobstvennoï vozrastnosti. [**The dependence of the length of [one-year-old] lateral shoots of *P. sylvestris* [within a whorl] upon their actual time of origin.**] *Dokl. Akad. Nauk SSSR* 67 (5), 1949 (925–7). 1 ref. [Russ.] A.P.B.

76. Hida, M. **Anatomical studies on assimilatory organs with induced dorsiventrality in some conifers.** *Bot. Mag., Tokyo* 64 (757/758), 1951 (157–62). 5 refs. [Jap.e.] I.M.I.

Two types of assimilatory organs with induced dorsiventrality, the *Thujopsis* and the *Podocarpus imbricata* types, are distinguished and described in detail.

77. Lee, C. L. **The anatomy and ontogeny of the leaf of *Dacrydium taxoides*.** *Amer. J. Bot.* 39 (6), 1952 (393–8). O.B.D.

78. Fortunatov, I. K. Morfologičeskoe vyraženie vozrasta pobegov u topolja raznolistnogo. [**Morphological expression of shoot age in *Populus diversifolia*.**] *Dokl. Akad. Nauk SSSR* 64 (3), 1949 (395–6). [Russ.] A.P.B.

A study of leaf-shape variation on various types of shoot.

79. Dahl, A. O. **The comparative morphology of the Icacinaceae, VI. The pollen.** *J. Arnold Arbor.* 33 (3), 1952 (252–86 + 9 plates). 32 refs.

80. Straka, H. Zur Feinmorphologie des Pollens von *Salix* und von *Artemisia*. [**The fine morphology of the pollen of *Salix* and *Artemisia*.**] *Svensk bot. Tidskr.* 46 (2), 1952 (204–27 + 2 plates). 41 refs. [G.] O.B.D.

165. *Phylogeny, Evolution. Heredity, Genetics, and Breeding, Variation*

See also Nos. 180, 256, 266–7, 449–51.

81. Hitt, R. G. **1952 report on forest tree breeding in Sweden and other European countries.** [University of Wisconsin?] 1952. pp. 88.

Includes appendixes on current research at Swedish and other European experiment stations; methods of grafting Oak and Pine; establishment of Aspen clones; production of Aspen seedlings; grafting of *Quercus*; and flower-induction.

82. Dorman, K. W. **Directory of forest genetic activities in the south.** *Sta. Pap. Stheast. For. Exp. Sta.* No. 17, 1952. pp. 17.

Lists: plant introduction stations, arboreta, and botanical gardens and their functions; studies on plantings of introduced species and on racial variation, selection and hybridization projects, and studies of vegetative propagation and the stimulation of seed production, under the institutes at which they are carried out; and organizations conducting tree-improvement work.

83. HODGKINS, E. J. **Effect of different heat treatments upon the viability and vigor of Pine pollen.** *J. For.* 50 (6), 1952 (450–2). 3 refs.

In order to find a convenient method of killing contaminating pollen in pollinating equipment without damaging the equipment, 51 samples of pollen from 9 species and one hybrid Pine, were subjected to various applications of heat. Temperatures of 74–77° C. were lethal after 24 hr., 77–80° after ca. 20 hr., and 80–82° after 15 hr. The vigour of surviving pollen was not decreased by subjection to 67–69°, but was significantly decreased by subjection to temperatures of 74° and upwards. Pine pollen is more resistant to heat than are the vegetative tissues of trees, and possibly as resistant as most tree seeds.

84. MARCET, E. Pollenuntersuchungen an Föhren (*Pinus silvestris* L.) verschiedener Provenienz. **[Researches on pollen from *P. sylvestris* of different provenances.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 27, 1951 (348–405 + 13 photos). 92 refs. [G.g.f.]

The material for this study was obtained from experimental plots containing trees of 6 provenances (Sweden, Livonia, East Prussia, Alsace, and two Swiss). The differences between pollens from different trees of the same provenance were so great as largely to mask any differences that may exist between different races. The character that seemed most constant within each provenance, and therefore best suited to express statistical differences between them, was the lengthwise distance apart of air sacs. There were also clear differences between provenances in rate of fall of pollen in calm air. There were differences in time of flowering, and the dependance of pollination on temperature and relative humidity of the air was demonstrated. The conditions of germination and growth of the pollen tube were studied. A continuous modification of the initial delay in germination and growth peculiar to some provenances was apparent, following the position from north to south of the provenances. The growth of the pollen tubes was found to depend on the reserves of starch in the pollen.

85. GOLUBINSKIĬ, I. I. Berezovyĭ sok kak sreda dlja proraščivanija pylcevyh zeren. **[Birch sap as a medium for the germination of pollen grains.]** *Dokl. Akad. Nauk SSSR* 68 (4), 1949 (773–5). 8 refs. [Russ.] A.P.B.

Birch sap collected during the spring sap flow proved a better medium for the germination of pollen from several species, including *Salix alba*, than sucrose solution with optimum sucrose concentration. Boiling the sap to improve its keeping qualities improved the result still further, but sap evaporated and re-dissolved was inferior to fresh or boiled sap.

86. ŠČEPOTJEV, F. L., and BORISENKO, T. T. O prorastanii pylcy greckogo oreha (*Juglans regia* L) v iskusstvennoĭ srede. **[The germination of *Juglans regia* pollen in an artificial medium.]** *Dokl. Akad. Nauk SSSR* 68 (3), 1949 (617–20). 2 refs. [Russ.] A.P.B.

Of various concentrations of glucose solution, with or without stigma tissue or a trace of heteroauxin, plain 0·5*N* glucose proved best for germination, about 40% germination occurring within 4 hours when the pollen was freshly gathered. In small storage trials, storage on ice maintained viability in a small % of pollen grains for 15 days: after 6 days 11% was still viable. Three days under room conditions killed all grains.

87. GHOSE, A. K. **Chromosome numbers and meiotic behaviour in two species of *Caesalpinia* [*C. sappan* and *C. coriaria*].** *Sci. & Cult.* 17 (9), 1952 (384–5). 3 refs. E.M.B.

88. GOTHE, H. Ein Kreuzungsversuch mit *Larix europaea* D.C., Herkunft Schlitz, und *Larix leptolepis* Gord. 1. Mitteilung. **[Trials in crossing *L. decidua* (Schlitz provenance) and *L. leptolepis*. First report.]** *Z. Forstgenet.* 1 (4), 1952 (108–10). 2 refs. [G.g.]

Gives details of the controlled pollinations made, cone lengths, seed yields and weights, germination and mortality, and first-year height growth of the progeny. Cones from the pollination *L. decidua* ♀ × *L. leptolepis* were longer than those from intraspecific crosses in *L. decidua*. Cones of selfed *L. decidua* were noticeably small. No definite conclusions can be drawn, however, as various mother trees were involved. To judge by the plant % under very favourable conditions, the % fertilization in interspecific was as high as or higher than in intraspecific crosses. All crosses with *L. leptolepis* as mother tree gave a higher plant % than those with *L. decidua* as mother. Seed from selfed *L. leptolepis* gave a plant % of only 1·5; and that from selfed *L. decidua*, nil. Hybrid vigour was observed in the 1-year-old progeny of the interspecific crosses in both directions. The progeny of the selfed *L. leptolepis* showed the poorest height growth of all.

89. DUFFIELD, J. W. **Relationships and species hybridization in the genus *Pinus*.** *Z. Forstgenet.* 1 (4), 1952 (93–100). 12 refs. [E.G.]

Discusses the results of crosses made at the Institute of Forest Genetics, California Forest and Range Experiment Station, within the sub-genus *Diploxylon*, and presents a proposed new arrangement of the group, according to the results of the crossing programme. [Cf. *For. Abstr.* 13 (No. 961).]

90. ZOBEL, B. **Oleoresin composition as a determinant of Pine hybridity.** *Bot. Gaz.* 113 (2), 1951 (221–7). 11 refs. O.B.D.

As illustrated by a study of a natural hybrid between *Pinus coulteri* and *P. jeffreyi* [cf. *For. Abstr.* 13 (No. 3619)], oleoresin analysis is a valuable method of studying Pine hybrids. The volatile-oil portion of the oleoresin is subjected to standard determinations of sp. gr., refractive index and optical rotation. In addition the % of material in the volatile oil not dissolved by concentrated H_2SO_4 is determined, using only 1 c.c. of the oil. These four characters appear to be closely correlated, and only one of them need be used in analysing the oleoresin of a hybrid. The characters are very constant throughout the parent species so that any variation found in the hybrid is extremely significant.

91. HALL, M. T. **Variation and hybridization in *Juniperus*.** *Ann. Mo. bot. Gdn.* 39 (1), 1952 (1–64 + 1 plate). 63 refs.

The existence of hybrid swarms between *Juniperus ashei* and *J. virginiana* led to an investigation of the populations, in order to find the extent and nature of the influence of the two species upon each other. A study of morphological variations was made, and an index was drawn up based on certain morphological characteristics. The index values are plotted on a map, and show the geographical distribution of the population characters. *J. ashei* influences *J. virginiana* by introgression throughout the Ozark Plateau, and probably as far east as the Tennessee River in the vicinity of the 36th parallel. The reciprocal influences are not so common, or so extreme. The introgression was possibly influenced by the fluctuations of the ranges of the two species, following on climatic fluctuations during and after the glacial periods. Differentiation in *J. virginiana* as a species is also discussed.

92. MULLER, C. H. **Ecological control of hybridization in *Quercus*: a factor in the mechanism of evolution.** *Evolution* 6 (2), 1952 (147–61). 16 refs. O.R.S.

Examples are quoted, for a number of Texan Oak species, of the restriction of successful hybridization by soil or climatic requirements of the progeny. The origin of *Q. margaretta*, which has developed on the Gulf coast from *Q. gambelii* populations after their isolation from the Rocky Mountain populations and only slightly from hybridization with *Q. stellata*, and of *Q. drummondii* from hybridization of *Q. margaretta* with *Q. stellata*, are discussed.

93. TUCKER, J. M. **Evolution of the Californian Oak *Quercus alvordiana*.** *Evolution* 6 (2), 1952 (162–80). 22 refs. O.R.S.

It is concluded from a study of various factors, including the stellate trichomes of the lower leaf surface and leaf persistence, that *Q. alvordiana* has developed through interbreeding of *Q. douglasii* and *Q. turbinella*. This hypothesis is suggested by the fossil distribution of *Q. turbinella* and *Q. douglasii*; no fossil Oak referable to *Q. alvordiana* has yet been found.

94. KRAHL-URBAN, J. Erbanlagen und Züchtungsmöglichkeiten bei Rotbuche, Stiel- und Traubeneiche. **[Hereditary factors and possibilities for selective breeding in *Fagus sylvatica*, *Quercus robur* and *Q. sessiliflora*.]** *Z. Forstgenet.* 1 (4), 1952 (114–20). Numerous refs. [G.]

Discusses various characteristics, such as early and late flowering, stem and crown form etc., and outlines, with reference to work done at the Lehrforstamt Bramwald, some suitable lines to be followed in selective breeding.

95. PAULEY, S. S., and JOHNSON, A. **Aberrant Silver Maples.** *J. Arnold Arbor.* 33 (3), 1952 (296–7 + 1 plate). 6 refs.

Aberrant mosaic forms were obtained by breeding from seed, but, although these abnormal forms suggested a virus infection, the mosaic could not be transmitted either by budding or by grafting.

96. HEINISCH, O. Die vordringlichsten Zuchtziele bei Sanddorn (*Hippophaë rhamnoides* L.). **[The most important aims in the selective breeding of *H. rhamnoides*.]** *Züchter* 22 (4/5), 1952 (144–7). 8 refs. [G.] A.P.B.

Aims discussed are: increased ease in berry-picking (by breeding for longer fruit stalks, tougher skins and reduced thorniness); increased berry size and vitamin C content, factors which normally vary inversely to each other; good shape for ornamental garden use (grafts on trees and shrubs, e.g. *Salix* spp., *Crataegus* spp., *Sorbus* spp., *Cornus sanguinea*, *Cydonia japonica* and *Quercus sessiliflora*, have not been successful); a good root system for use in stabilizing sand dunes; increased resistance to insects (*Gelechia* spp. and *Malacosoma neustria*), to fungi (*Fomes robusta*) and to *Oriophyes hippophaënus*; higher content of nutrients other than vitamin C; and the production of wood suitable for turning and of high calorific value. Propagation by layering is more successful than by cuttings.

97. CRAM, W. H. **Parent-seedling characteristics and relationships in *Caragana arborescens*, Lam.** *Sci. Agric.* 32 (7), 1952 (380–402). 37 refs. O.R.E.

Studies on *C. arborescens* seemed to show that no close relationship exists between the degree of pod or seed set in the tree and the size of seedlings resulting from either self- or open-pollination, or between self-fertility of the parent tree and (*a*) the amount or speed of germination of either self- or open-pollinated seed, or (*b*) the vigour of the progenies at 150 days old. The large differences in height between the seedling progenies indicate genetical differences in the parent trees, so that selection and hybridization within the species should lead to the production of more valuable commercial types.

98. PILIPENKO, F. S. Vido- i formoobrazovanie evkaliptov. **[The formation of species and forms in *Eucalyptus*.]** *Agrobiologija* 1950 (4), (45–59). [Russ.] A.P.B.

Reviews work done on this subject since 1934 by the All-Union Breeding Station for Moist-Subtropical Crops, Sukhum, from the point of view of 'Michurin biology', which claims that characters acquired by interaction with the environment are inherited and that successful breeding can be done on this basis. It is stated [without full details of the evidence] that under the influence of new environmental conditions—here, those of the Black Sea coast of Caucasia—new forms arise, or even that some species are converted into others, both by seed and by vegetative reproduction (e.g. coppice), such progeny differing in morphological and/or physiological characters (e.g. frost resistance) from the parents. Natural species may be converted into one or more other species, without transitional forms; 'species of hybrid origin' are converted as a rule into several existing species and a large number of new and intermediate forms. The degree of inherited resistance of such new forms is said to depend directly on the correspondence of their hereditary nature to the environment—forms in which this correspondence is incomplete change into new forms more adapted to the environment concerned. Most

of the forms surpass, and in any case do not fall behind their parents in frost resistance. These variations or 'transformations' are observed in the progeny raised from local but not in that from Australian seed; they are said to have arisen in some cases where cross-pollination could not have occurred. At the same time, about 10 natural hybrids are said to occur on the Black Sea coast, differing from their parents in vigour of growth, lower demands on the soil, and in some cases greater frost resistance. The following are believed to be of practical interest: *E. viminalis* × *E. camaldulensis*, *E. v.* × *E. macarthuri*, *E. v.* × *E. maideni*, *E. v.* × *E. ovata*; *E. macarthuri* × *E. maideni*; *E. smithii* × *E. maideni*; and *E. globulus* × *E. ovata*.

The following may be quoted from examples given: (1) A tree of *E. stuartiana* was frozen back to the root in 1924–25; coppice soon appeared which differed markedly in morphology and frost-hardiness and was referred on morphological features to *E. subviridis*. (2) *E. angophoroides* was found among the progeny of *E. deanii*; in 1949–50, when the latter and *E. viminalis* were frozen back to the root in a month of frost (minimum — 10° C.), *E. angophoroides* suffered only slight leaf damage.

It is suggested *inter alia* that taxonomists have taken too narrow a view of species limits and that a revision of the genus is much needed.

99. **[Breeding *Duboisia* spp. for the production of atropine and hyoscine.]** *Rep. Commonw. sci. industr. Res. Organ. Aust. 1950–51*, 1951 (20).

Some strains of *D. myoporoides* yield hyoscine in greater amount and more consistently than others, and clones of these are being propagated. Hybrids of *D. myoporoides* and *D. leichhardtii* show heterosis, and their alkaloid content is being investigated.

166. *Economic Botany*

See also Nos. 116, 141.

100. CONDOMINAS, G., and HAUDRICOURT, A. Première contribution à l'ethnobotanique indochinoise. Essai d'ethnobotanique Mnong gar (Protoindochinois du Vietnam). **[A preliminary contribution to Indochinese ethnobotany. A study of the ethnobotany of the Mnong gar (a Proto-indochinese tribe of Vietnam).]** *Rev. int. Bot. appl. Agric. trop.* 32 (351/352; 353/354), 1952 (19–27; 168–80). [F.] P.R.

Discusses the vernacular names and the use of wild and cultivated plants for food, textiles, medicines, poisons, firewood and building timber and in ritual.

168. *Histology*

See also Nos. 614 *et seq.*

101. GAUTHERET, R. J. Action du contact d'un milieu aqueux sur la morphogénèse des cultures de tissu cambial de *Salix caprea*. **[Action of an aqueous medium on the morphogenesis of cultures of cambial tissue of *S. caprea*.]** *Comptes Rendus des Séances de la Société de Biologie et des ses Filiales, Paris* 144 (9/10), 1950 (626–9). 1 ref. [F.] O.R.S.

102. GAUTHERET, R. J. Recherches sur les phénomènes d'histogénèse provoqués par l'action de l'acide indole-acétique sur le tissu cambial et le liber de *Salix caprea*. **[Research on phenomena of histogenesis induced by the action of indole-acetic acid on the cambial tissue and phloem of *S. caprea*.]** *Comptes Rendus des Séances de la Société de Biologie et de ses Filiales, Paris* 144 (9/10), 1950 (622–6). 2 refs. [F.] O.R.S.

17. SYSTEMATIC BOTANY

172.3. Bacteria

See also No. 452.

103. PATEL, M. K., KULKARNI, Y. S., and DHANDE, G. W. **Two new bacterial diseases of plants.** *Curr. Sci.* 21 (3), 1952 (74–5). A.P.B.

Describes two Indian species of *Xanthomonas*—*X. clerodendroni* sp. nov. on *Clerodendron phlomoides*, and *X. sesbaniae* sp. nov. on *Sesbania aegyptiaca*.

172.8. Eumycetes (True Fungi)

See also Nos. 69–72, 421 *et seq.*, 511, 770 *et seq.*

104. AHMED, Q. A. **Fungi of East Bengal.** *Pakistan J. For.* 2 (2), 1952 (91–115). 11 refs.

A systematically classified list, with indexes to host species and fungus genera.

105. MIELKE, J. L., and COCHRAN, G. W. **Differences in spore surface markings of three Pine rusts [*Cronartium filamentosum, C. stalactiforme, C. harknessi*], as shown by the electron microscope.** *Mycologia* 44 (3), 1952 (325–9). 6 refs. P.R.

106. JØRGENSEN, H. A. **Studies on *Nectria cinnabarina*. Hosts and variations.** *Årsskr. Vet.-Landbohøjsk. 1952*, 1952 (57–120). 95 refs. [E.e.]

The paper gives first a general account of the occurrence of *N. cinnabarina* in Denmark. A survey of the taxonomic division of the genus *Nectria* is followed by an account of the nomenclature of this species and an index of synonyms. The section on susceptibility and virulence includes a host index for the fungus in Denmark containing 105 plant species, only 4 of which are gymnosperms (*Abies alba*, *Juniperus*, *Picea abies* and *Pinus strobus*). Inoculation experiments made by the author lead him to conclude that *N. cinnabarina* cannot be divided into pathogenic races, nor was he able to establish the existence of particularly virulent forms of it. No cultural or morphological variations were observed between isolates of the fungus from *Acer pseudoplatanus*, *Aesculus hippocastanum*, *Fagus sylvatica*, and *Ulmus laciniata*. The writer is of the opinion that *Nectria ribis* (Tode) Oud. cannot be considered a species, but must be regarded as a variety of *N. cinnabarina*, for which the name *N. cinnabarina* var. *ribis* var. nov. is proposed.

Optimum growth of all the isolates of *N. cinnabarina* as well as of the variety *ribis* occurred at + 23° C., and maximum growth at + 33°. It was not possible to establish the temperature for minimum growth, but it seems to be ca. 0°. *From author's summary.*

107. PESANTE, A. Nuove segnalazioni di *Septobasidium*. **[New records of *Septobasidium* spp.]** *Ann. Sper. agr.* (*n.s.*) 6 (3), 1952 (655–9 + 1 plate). [It.it.e.] C.G.B.

S. mariani was found on *Corylus avellana*, *Carpinus betulus*, and *Crataegus oxyacantha*. Another, unidentified, species of *Septobasidium* is also described.

108. HENNIG, R. Über die bei uns vorkommenden *Sparassis*-Arten (Krause Glucke und Eichen Glucke) und ihren Parasitismus an Waldbäumen. **[German *Sparassis* species and their parasitism on forest trees.]** *Forstwiss. Cbl.* 71 (3/4), 1952 (108–16). 24 refs. [G.]

Deals mainly with *S. ramosa*, presenting notes based on German literature, and the author's own observations. The distribution, species attacked, and nature of the damage are discussed, and several new hosts are mentioned. A short note on *S. laminosa* is also included.

174. *Spermatophyta, Seed-Plants in General. Floras and Check-Lists*

See also No. 606.

109. LI, H.-L. **Families and genera of Formosan plants, III. Casuarinaceae to Caryophyllaceae.** *Quarterly Journal of the Taiwan Museum, Taipei* 4 (3/4), 1951 (213–52). [E.chin.] [Cf. *For. Abstr.* 13 (No. 98).]

110. WYATT-SMITH, J. **Pocket check-list of [Malayan] timber trees.** *Malay. For. Rec.* No. 17, 1952. pp. 171 + blank pages for notes. Price $3·00 (7*s.* 6*d.*).

Contains four parts—(1) Dipterocarps, (2) Non-Dipterocarps, (3) scientific names, (4) keys to Dipterocarps.

111. TISSERANT, P. C. Catalogue de la flore de l'Oubangui-Chari. **[Check-list of the flora of Ubangi-Shari.]** *Mémoires de l'Institut d'Études Centrafricaines, Brazzaville* (*A.E.F.*) No. 2, 1950. pp. 166. [F.] Price *Fr.*800.

112. TURRILL, W. B., and MILNE-REDHEAD, E. [Editors]. **Flora of Tropical East Africa: Marantaceae.** Crown Agents for the Colonies, London. 1952. pp. 11. Price 1*s.* 3*d.*

113. TURRILL, W. B., and MILNE-REDHEAD, E. [Editors]. **Flora of Tropical East Africa: Oleaceae.** Crown Agents for the Colonies, London. 1952. pp. 31. Price 2*s.* 9*d.*

114. PARDY, A. A. **Notes on indigenous trees and shrubs of S. Rhodesia.** *Reprs.* from *Rhod. agric. J.* 49 (2), 1952 (74 . . . 84 + 12 plates).

Thespesia garckeana, *Syzygium guineense*, *Combretum microphyllum*, *Stereospermum kunthianum*, *Afzelia quanzensis*, and *Combretum gueinzii*.

115. FRIES, R. E.; SANDWITH, N. Y.; AMSHOFF, G. J. H.; BREMEKAMP, C. E. B. **Contributions to the flora of Tropical America: LIV. New trees and shrubs from British Guiana.** *Kew Bull.* 1952 (2), (255–60).

Includes accounts of the following new tree species: *Guatteria flexilis*, *Duguetia decurrens*, *Nectandra miranda*, *Drypetes fanshawei*, *Antirrhoea guianensis*.

116. LE COINTE, P. Amazônia brasileira. III. Árvores ed plantas úteis (indígenas e aclimadas). Nomes vernáculos e nomes vulgares, classificação botânica, habitat, principais aplicações e propriedades. **[The Amazonian region of Brazil. III. Trees and useful plants (native and exotic). Vernacular and native names, botanical classification, habitat, principal uses and properties.]** *Brasiliana* 251 (2nd ed.) 1947. pp. 506 + 12 plates. [Port.] I.F.B.

An alphabetical list of vernacular names with equivalent botanical names and brief notes.

117. KEITH, H. G. **A preliminary list of North Borneo plant names.** *N. Borneo For. Rec.* No. 2 (2nd ed.) 1952. pp. 528. Price $15·00 (35*s.*)

A thorough revision of the 1st ed. (1937), now out of print.

118. HILDEBRAND, F. H. Verbeterde boomnamenlijst van 'Bulungan en Baraoe' (Oost Borneo). **[Revised list of tree species collected in the 'Bulungan and Berau' district (E. Borneo).]** *Rapp. Bosbouwproefsta., Bogor* No. 55, 1952. pp. 83. [Jav.Du.E.]

The list is in two parts arranged (1) by vernacular names and (2) under family, genus and species. Each part gives vernacular name, its language or dialect, scientific name and durability class of the wood. [Cf. *For. Abstr.* 13 (Nos. 1888–90).]

119. HILDEBRAND, F. H. Verbeterde boomnamenlijst van de oostkust van Sumatra. **[Revised list of tree species from the east coast of Sumatra.]** *Rapp. Bosbouwproefsta., Bogor* No. 56, 1952. pp. 66. [Jav.Du.E.]

The list is in two parts arranged (1) by vernacular name and (2) under family, genus and species. Each gives vernacular name, its language or dialect, scientific name, and durability class of the wood. [Cf. *For. Abstr.* 13 (Nos. 1888–90).]

174.2. Gymnosperms

See also Nos. 89–91.

120. GAUSSEN, H. Les gymnospermes actuelles et fossiles. **[Extant and fossil gymnosperms.] Fasc. I, II Pteridospermales, Cycadales; Fasc. III Bennettitales, Cordaïtales, Ginkgoales; Fasc. IV Coniferales Pt. 1: Pinoïdines.** *Trav. Lab. for. Toulouse* 2, I (1–2); (3); (4), 1944; 1946; 1952. pp. 72 + 40 + 104; 32 + 26 + 24 + 54; 43 + 248 + many illustrations. [F.]

121. FRANCO, J. DO AMARAL. Espécies do género *Agathis* Salisb. cultivadas em Portugal. **[Species of *Agathis* cultivated in Portugal.]** *An. Inst. Agron., Lisboa* 18, 1951 (99–115 + 6 plates). 9 refs. [Port.e.]

Presents a botanical description of the genus *Agathis* and detailed accounts of the species cultivated in Portugal viz. *A. alba*, *A. robusta* and *A. vitiensis*.

122. WILDE, M. H., and EAMES, A. J. **The ovule and 'seed' of *Araucaria bidwillii* with discussion of the taxonomy of the genus. II. Taxonomy.** *Ann. Bot.* 16 (61), 1952 (27–47 + 2 plates). 80 refs. O.R.E.

Deals with the taxonomic and historical background of the genus *Araucaria*, with a discussion and evaluation of characters used as a basis for sectional division. The 3 existing sections are more clearly

delimited and a new section—Section *Bunya*—is proposed for *A. bidwillii*, which is removed from the section *Columbea*. A key to the 4 sections is given. [Cf. *For. Abstr.* 10 (No. 1627).] *Authors' summary.*

123. MELLE, P. J. VAN. ***Juniperus texensis* sp. nov.—West-Texas Juniper in relation to *J. monosperma, J. ashei et al.*** *Phytologia* 4 (1), 1952 (26–35). A.P.B.

124. FLORIN, R. **On *Metasequoia*, living and fossil.** *Bot. Notiser* 1952 (1), (1–29). Numerous refs. [E.] O.B.D.

Notes on the discovery of living *Metasequoia glyptostroboides*, its morphology, taxonomy, geographical distribution and ecology, and its cultivation in Asia, North America and Europe, with a review of present knowledge of fossil *Metasequoia*.

125. WYMAN, D. ***Metasequoia* brought up-to-date.** *Arnoldia, Harvard University, Mass.* 11 (3), 1951 (25–8). L.S.

Gives records of some specimens grown in the U.S.A. since 1947 and lists 20 species of plant native to the same location in China which are hardy, and 8 which are not hardy, at the Arnold Arboretum.

176.1. Dicotyledons

See also Nos. 92–3, 98, 618, 620–1.

126. PARDÉ, L. Les feuillus. **[Broadleaved trees.]** La Maison Rustique, 26 Rue Jacob, Paris 6e. Reprint, 1952. pp. 383. [F.] Price *Fr.*1500 (33*s.* 6*d.*)

A reprint of a work first published in 1941. It gives a systematic account of broadleaved species indigenous to or cultivated in France and is a companion to the same author's work on conifers.

127. ÉVRARD, F. Anacardiacées, Mangiferées nouvelles indochinoises. 1. *Mangifera, Gluta, Swintonia.* **[New Anacardiaceae, Mangiferae from Indo-China. 1. *Mangifera, Gluta, Swintonia.*]** *Bull. Soc. bot. France* 99 (1/3), 1952 (82–4). [F.] O.B.D.

M. flava, M. minutifolia, G. gracilis, G. compacta and *S. minuta*.

128. PICHON, M. Classification des Apocynacées: XXXIV. Les Malouetiinae d'Afrique. **[Classification of the Apocynaceae. XXXIV. The African Malouetiinae.]** *Bull. Jard. bot. Brux.* 22 (1/2), 1952 (115–35). 9 refs. [F.] O.B.D.

All species of the Belgian and French Congo can be classed under *Malouetia bequaertiana*, the range of which extends to Gabon. A new African species is described, *M. brachyloba* sp. nov., found near Yangambi. A new genus of the Malouetiinae, *Malouetiella*, is erected to cover a new species from the Belgian Congo, *M. parviflora* sp. nov.

129. MEYER, T. Apocinaceas argentinas. II. *Aspidosperma.* **[Argentine Apocynaceae. II. *Aspidosperma.*]** *Lilloa* 23, 1950 (29–48 + 2 plates). [Span.e.] A.P.B.

A summary of a revision of the Argentine species of *Aspidosperma* with a description of a new tree species, *A. spegazzinii*.

130. HUTNIK, R. J. **Identification of very small Birch seedlings.** *J. For.* 50 (7), 1952 (558).

131. GAGNEPAIN, F. Quelques *Connarus* nouveaux d'Indochine. **[Some new *Connarus* species from Indo-China.]** *Bull. Soc. bot. France* 99 (1/3), 1952 (29–31). [F.] O.B.D.

Includes a description of a new tree species, *C. poilanei*.

132. HERLEMONT, R. Les Élaeocarpacées d'Indo-Chine. (Étude d'anatomie et d'histologie comparées de la feuille). **[The Elaeocarpaceae of Indo-China. (A study of the comparative anatomy and histology of the leaf).]** *Ann. Sci. nat.* (*Bot.*) (*Sér. 11*) 12, 1952 (1–119). 24 refs. [F.] O.B.D.

A study of 47 species of *Elaeocarpus* and *Sloanea*, with a key based on the characteristics studied, and notes on geographical distribution.

133. VASCONCELLOS, J. DE CARVALHO E, and FRANCO, J. DO AMARAL. A *Quercus faginea* Lam. na flora e na vegetação natural portuguesas. **[*Q. faginea* in the flora and natural vegetation of Portugal.]** *An. Inst. Agron., Lisboa* 18, 1951 (95–8). 9 refs. [Port.port.]

Short notes on taxonomy, morphology and the plant associations of which it is a dominant species in parts of Portugal.

134. SLEUMER, H. Algunas Flacourtiáceas Sudamericanas. **[Some South American Flacourtiaceae.]** *Lilloa* 23, 1950 (247–51). [Span.] A.P.B.

Describes a new tree species, *Neosprucea kuhlmannii*, and the distribution of other South American Flacourtiaceae.

135. KOSTERMANS, A. J. G. H. **Some new names in African species of *Beilschmiedia* Nees (Lauraceae).** *Bull. Jard. bot. Brux.* 22 (1/2), 1952 (137–8). O.B.D.

136. LÉONARD, J. Notulae systematicae XII. Les genres *Macrolobium* Schreb. et *Gilbertiodendron* J. Léonard au Congo Belge (Caesalpiniaceae). **[Notulae systematicae XII. The genera *Macrolobium* and *Gilbertiodendron* in the Belgian Congo (Caesalpiniaceae).]** *Bull. Jard. bot. Brux.* 22 (1/2), 1952 (185–91). [F.] O.B.D.

Describes a new variety and species of *Macrolobium* and erects a new genus, *Gilbertiodendron*, under which are grouped several species formerly attributed to *Macrolobium*.

137. GILBERT, G., and BOUTIQUE, R. Groupes nouveaux de Mimosacées et Caesalpiniacées. **[New groups of the Mimosaceae and Caesalpiniaceae.]** *Bull. Jard. bot. Brux.* 22 (1/2), 1952 (177–84). [F.] O.B.D.

138. GAGNEPAIN, F. Mimosées nouvelles d'Indochine. **[New Mimosaceae from Indo-China.]** *Bull. Soc. bot. France* 99 (1/3), 1952 (46–51). [F.] O.B.D.

Includes descriptions of some new tree species of *Entada, Delaportea, Albizzia* and *Pithecellobium*.

139. GAGNEPAIN, F. Un nouveau genre de Mimosées: *Ortholobium.* **[A new genus of the Mimoseae: *Ortholobium.*]** *Bull. Soc. bot. France* 99 (1/3), 1952 (36–8). [F.] O.B.D.

Erects the new genus to cover *O. balansae* (= *Pithecolobium balansae* Oliver in Hook) and 3 new tree species from Indo-China.

140. Brenan, J. P. M. **Plants of the Cambridge Expedition 1947–1948: II. A new order of flowering plants from the British Cameroons.** *Kew Bull.* 1952 (2), (227–36).

The monotypic new order Medusandrales and family Medusandraceae, based on *Medusandra richardsiana* gen. et sp. nov., a tree of high forest round the Native Administration timber-camp at Banga, and near Bombe. Morphologically it has no very obvious affinities, but is perhaps best placed near the Olacales and Santalales. [Cf. *For. Abstr.* 14 (No. 621).]

141. Perrier de la Bathie, H. Les Myrtacées utiles de la région Malgache. **[Useful Myrtaceae of the Madagascar region.]** *Rev. int. Bot. appl. Agric. trop.* 32 (353/354), 1952 (112–6). [F.] P.R.

142. Chevalier, A. Travaux français sur le genre *Eucalyptus*. **[French studies on the genus *Eucalyptus*.]** *Rev. int. Bot. appl. Agric. trop.* 32 (353/354), 1952 (105–12). [F.] P.R.

A brief review of work from the 18th century to the present day.

143. Jacques-Félix, H. Les *Cassipourea* d'Afrique occidentale. **[The *Cassipourea* spp. of western Africa.]** *Rev. int. Bot. appl. Agric. trop.* 32 (355/356), 1952 (264–72). [F.] P.R.

144. Hauman, L. Sur quelques Rosacées d'Afrique tropicale. **[Some Rosaceae from tropical Africa.]** *Bull. Jard. bot. Brux.* 22 (1/2), 1952 (87–95). [F.] O.B.D.

Includes a description of a new tree species, *Pygeum crassifolium*.

145. Steyermark, J. A. **The genus *Platycarpum* (Rubiaceae).** *Amer. J. Bot.* 39 (6), 1952 (418–23). 13 refs. O.B.D.

A taxonomic study introducing 3 new species: *P. decipiens* and *P. rhododactylum* from southern Venezuela, and *P. duckei* from northern Brazil.

146. Gagnepain, F. Huit *Meliosma* (Sabiacées) nouveaux d'Indochine. **[Eight new species of *Meliosma* (Sabiaceae) from Indo-China.]** *Bull. Soc. bot. France* 99 (1/3), 1952 (9–13). [F.] O.B.D.

147. Houtzagers, G. Il genere *Populus* e la sua importanza nella selvicoltura. **[The genus *Populus* and its importance in forestry.]** *Biblioteca Scientifica Cartiere Burgo, Casale Monferrato* No. 3, 1950 (1951). pp. 291. Many refs. [It.]

A translation into Italian of the work published in Holland in 1937.

148. Herbignat, A. Les peupliers américains: leur importance pour l'Europe. **[American Poplars: their importance for Europe.]** *Revue de l'Agriculture, Bruxelles* 5 (6), 1952 (583–90). [F.] L.S.

Discusses the report of the O.E.E.C. mission. [Cf. *For. Abstr.* 13 (No. 2809); 14 (No. 219).]

149. Sillans, R. *Manilkara aubrevillei*, Sapotacée nouvelle de l'Oubangui-Chari. **[*M. aubrevillei*, a new species of Sapotaceae from Oubangui-Chari.]** *Bull. Soc. bot. France* 99 (1/3), 1952 (42–4). 13 refs. [F.] O.B.D.

150. Pellegrin, F. Les Sterculiacées du Gabon. **[The Sterculiaceae of Gabon.]** *Bull. Soc. bot. France, Mémoires* 1950–51 (1951), (29–49). [F.] O.B.D.

151. Sandwith, N. Y., and Kobuski, C. E. **Contributions to the flora of Tropical America. LIII. A South American species of *Symplococarpon*.** *Kew Bull.* 1952 (2), (249–51). 3 refs.

Describes a new tree species, *S. australe*.

152. Lawalrée, A. *Ulmus hollandica* Mill. en Belgique. **[*U. hollandica* in Belgium.]** *Bull. Jard. bot. Brux.* 22 (1/2), 1952 (65–70). [F.] O.B.D.

A key to and notes on the different forms of *U. hollandica* (i.e. *U. carpinifolia* × *glabra*) to be found in Belgium.

18. PLANT ECOLOGY

See also No. 345.

181. *Mode of Life, Autecology. Silvicultural Characters of Trees*

See also Nos. 61, 188, 230–1, 262, 605.

153. Khan, M. A. W. ***Lannea grandis* Engler.** *Indian For.* 78 (6), 1952 (311–4).

Observation of *Lannea grandis* in Madhya Pradesh shows that it needs the following conditions for normal growth there: (1) a moderately deep soil with a fair amount of humus; (2) moderately sloping ground; (3) a fairly dry soil; (4) moderate shade during regeneration and establishment; (5) full overhead light from the sapling stage to middle age; (6) moderate overhead shade or protection from hot sun and winds in later life. Seed is dispersed mainly by crows. In mixed forest it is a moderate coppicer, but on dry upper hill slopes it does not coppice at all. Figures are given for rate of growth of unthinned coppice in mixed forest.

181. Distribution, Natural Range

154. Tschermak, L. Die natürliche Holzartenverbreitung im Umkreis von Wien in ihrer Abhängigkeit von Klima. **[Natural distribution of woody species in the area around Vienna in relation to climate.]** *Wetter und Leben, Vienna* 3 (5/7), 1951 (103–8). 22 refs. [G.] L.S.

155. Meyer, K. A. Frühere Verbreitung der Holzarten und einstige Waldgrenze im Kanton Wallis. 2. Mittelwallis. **[Former distribution of tree species and former timberline in the Canton of Valais. 2. Central Valais.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 27, 1951 (287–347). [G.g.f.]

Cf. *For. Abstr.* 12 (No. 2576).

156. Hewetson, C. E. **Sal (*Shorea robusta*) in South Bastar forest division.** *Indian For.* 78 (8), 1952 (409–10 + 5 photos + 1 map).

Several outlying areas of Sal, well to the south of the present limit of natural Sal forest, confirm the belief that the present limit is an artificial one. [Cf. *For. Abstr.* 10 (No. 2494).]

181.2. Atmospheric Relations. Acclimatization

See also Nos. 98, 124–5, 154.

157. Vaartaja, O. Päivän pituuden vaikutuksesta puiden kasvuun. **[Photoperiodism in**

Finnish trees.] *Metsät. Aikak* 1951 (4), (105–7). [Fi.e.]

The Institute of Plant Pathology at Helsinki University carried out experiments on photoperiodism by growing seedlings in separate rooms with the same temperature but different photoperiods. The rooms were exposed to daylight, the additional light being supplied by fluorescent lamps. Seedlings from S. Finland of *Pinus sylvestris*, *Picea abies*, *Betula pubescens*, *B. verrucosa*, and *Alnus incana* were tested. All species were very sensitive to day length. Seedlings exposed to 8 or 14 hr. daylight remained very small, e.g. *B. verrucosa* exposed to 8-hr. days gained only 1 mg. dry weight over 3 months as against 17 mg. for 24-hr.-day seedlings. Resting buds were formed, and leaves became brown, later in seedlings exposed to continuous illumination. Pine seedlings exposed to a short photoperiod turned bluish earlier than those exposed to continuous lighting. Seedlings exposed to continuous lighting started the rest period later than normally; Pine and Spruce seedlings sown in early June started the rest period in October–November. Day length was also found to affect the start of a new growing season; Pine and Spruce exposed to continuous light started growth in February–March, short-day seedlings only in March–April. Seedlings exposed to continuous light with a maximum of only 5000 luxes grew slowly, but the reduced intensity did not in itself interrupt growth between December and April. The importance of individual variations in seedling reactions in tree breeding is stressed. [Cf. *For. Abstr.* 12 (No. 2837).]

158. Ozol, A. M. Zimostoĭkostj greckogo oreha i drugih orehov. **[Winter-hardiness of *Juglans regia* and other species of Walnut.]** *Dokl. Akad. Nauk SSSR* 66 (4), 1949 (725–8). [Russ.] A.P.B.

In the Moscow region winter-hardiness decreases in the order *J. mandschurica* and *J. cinerea*, *J. nigra* and *J. cordiformis*, *J. regia*. The last also shows wide variation in winter-hardiness.

181.3. Water, Soil and Root Relations (including Bacterial and Mycorrhizal Symbiosis)

See also Nos. 18–25, 30–2, 62–3, 227, 268, 350, 546.

159. Pereira, H. C. **Water use by forest covers on the Aberdares.** *Rep. E. Afr. Agric. For. Res. Organ. 1951*, 1952 (68).

The depth of soil profile from which water is drawn was investigated by washing out the root systems of mature specimens of indigenous Bamboo [*Arundinaria alpina*], plantation Cypress [*Cupressus macrocarpa*] and Pine [*Pinus patula*]. It was found that Bamboo can draw on all available soil moisture from the first 12 ft. of soil, and on some of the moisture as far as the 17 ft. excavated. Cypress can draw on all available soil moisture in the first 6 ft. and some to a depth of 16 ft.; no roots were found below 16 ft. *P. patula* can draw on all available soil moisture from the first 14 ft., and to some extent down to and beyond the 18 ft. examined.

160. Parker, J. **Moisture retention in leaves of conifers of the Northern Rocky Mountains.** *Bot. Gaz.* 113 (2), 1951 (210–6). 15 refs. O.B.D.

Drying experiments were made in the laboratory with leaves on cut branches and leaves separated from their branches, in order to investigate problems affecting moisture retention, and wilting and recovery. Dried leaves of *Pinus ponderosa* retained more moisture when attached to cut branches than did those of *P. monticola*, *Pseudotsuga taxifolia*, *Thuja plicata*, *Abies grandis* and *Picea engelmanni*. When leaves were stripped from the branches and allowed to dry, those of *P. taxifolia*, and *P. ponderosa* had a higher moisture content than the other species tested, and those of *T. plicata* and *P. monticola* retained more moisture than those of *A. grandis* or *P. engelmanni*. If the tetrazolium test is a test of relative viability, it did not give any results to substantiate the claim that the more drought-resistant conifers can recover better from a low leaf-moisture content than the less drought-resistant species. More work of this kind needs to be done before any definite conclusions can be drawn.

161. Køie, M. **Relations of vegetation, soil and subsoil in Denmark.** *Dansk bot. Ark.* 14 (5), 1951 (1–164). Numerous refs. [E.dan.] O.B.D.

162. Delgado, R. F. **The effect of Bamboo on succeeding crops.** *Trop. Agriculture, Trin.* 28 (1/6), 1951 (50–2 + 4 photos).

Experiments were made at the Puerto Rico Federal Experiment Station to determine the effect of Bamboo (*Bambusa longispiculata*) on succeeding crops. The results indicate that Bamboo had no adverse effect on the crops tested (molasses grass, tropical kudzu, sweet potatoes, and bananas). When a root crop, such as sweet potatoes, is to be grown, the ground should be ploughed and disked and then planted with a legume for at least a year before the new crop is planted. The decomposed Bamboo roots add organic matter and leave small openings which improve soil aeration.

163. Panov, A. Mikoriza. **[Mycorrhiza.]** *Godišnj. Inst. nauč. šumar. Istraž., Sarajevo* No. 1, 1951 (80–105). 25 refs. [Croat.e.f.russ.]

A preliminary review of the literature, with further discussion promised.

164. Santos, N. Ferreira dos. Micorrizas de *Quercus suber* L. **[Mycorrhizae of *Q. suber*.]** *Publ. Serv. flor. aqüic. Portugal* 18 (1), 1951 (5–13 + 4 plates). 7 refs. [Port.e.]

Describes three types of ectotrophic mycorrhiza found on roots of a single *Q. suber* tree.

165. Harley, J. L., and McReady, C. C. **The uptake of phosphate by excised mycorrhizal roots of the Beech. II. Distribution of phosphorus between host and fungus.** *New Phytol.* 51 (1), 1952 (56–64 + 4 photos). 3 refs. [Department of Botany, University of Oxford.] O.R.S.

(1) Excised tips of mycorrhizal roots were dissected after having absorbed radio-active P from aerated media at pH 5·5 and were shown to have approximately 90% of the accumulated P in the fungal sheath. This distribution was constant over a range of dilute phosphate concentrations at

different times in the growing season. (2) Experiments on progressive accumulation showed that in P concentrations of 1 mg./litre no significant change in the ratio occurred over a period of 6½ hr. (3) Comparison, in the field, of attached and detached mycorrhizae showed no significant difference in the proportion of P in the sheath even when there was a detectable passage of P into the host tree. (4) The proportion retained in the sheath of detached mycorrhizae may be decreased by replacing O with N in the gas stream, by adding Na azide to the gas stream, and to some extent by using high phosphate concentrations. (5) Cores of mycorrhizal tips freed from their sheaths before exposure to phosphate, absorb P at a rate 4 times as great as that of cores of intact tips. *From authors' summary.* [Cf. *For. Abstr.* 12 (No. 2616); 13 (No. 1943).]

166. Uemura, S. **Studies on root nodules of Alders (*Alnus* spp.). IV. An experiment on the isolation of actinomycetes from Alder nodules.** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 52, 1952 (1–22). 16 refs. [Jap.e.]

[Cf. *For. Abstr.* 13 (No. 2829).] In isolation experiments extending over 2½ years, 63 stocks of actinomycetes were isolated from 87 tests on root nodules of *A. japonica* and 13 from 72 tests on *A. firma*. A number of bacteria were also obtained. The actinomycetes were isolated chiefly between late March and late September, and especially in May. Nodules from 1- and 2-year seedlings gave the best results. *From author's summary.*

167. Virtanen, A. I., and Miettinen, J. K. **Free amino-acids in the leaves, roots and root nodules of the Alder (*Alnus*).** *Nature, Lond.* 170 (4320), 1952 (283–4). 8 refs. [Biochemical Institute, Helsinki.]

In order to gain information on the mechanism of the atmospheric N fixation and the N metabolism in general, the seasonal occurrence of free amino-acids in different parts of *A. glutinosa* and *A. incana* was studied. The free amino-acid found most abundantly in the roots and root nodules was L (+)-citrulline. The citrulline content of the nodules of both *Alnus* spp. increases greatly in the autumn, rising from 0·2–0·3% in summer to about 1–2% of the dry weight of the tissue. The nodules of *A. incana* also contained appreciable quantities of γ-amino-butyric acid (ca. 0·2% of dry weight). The great accumulation of citrulline in the nodules in autumn suggests that citrulline in the Alder may have the rôle of a nitrogen store similar to that envisaged for glutamine and asparagine in leguminous plants.

168. Bond, G. **The fixation of nitrogen associated with the root nodules of *Myrica gale* L., with special reference to its pH relation and ecological significance.** *Ann. Bot. (n.s.)* 15 (60), 1951 (447–59 + 1 plate). 15 refs. [University of Glasgow.] O.R.E.

Evidence is presented to show that N fixation is associated with nodulated plants of *Myrica gale* under experimental conditions. During the first growth season of young plants the fixation per plant was of comparable magnitude to that of legumes under similar conditions.

When young plants, growing in water culture without combined N at 4 different pH levels between 3·3 and 6·3, were inoculated with the nodule organism, nodules formed at all pH levels but were sparse at pH 3·3, and most of the plants at this pH died. The best growth of nodulated plants in their first season was at pH 5·4.

Non-nodulated plants supplied with nitrate N showed strongest growth at pH 3·3, indicating that the poor growth of inoculated plants at this pH was due to difficulties in nodule formation, and not to inability of the plant itself to grow under such acid conditions. Compared with the legume nodule organism, however, the *Myrica* organism is markedly adapted to acid conditions.

These observations agree with data on the pH of *M. gale* in the field, and help to explain its distribution and habits. There is no reason to doubt that fixation of N is also associated with the normally nodulated plant in the field, and that it is of considerable ecological importance in the bog habitats frequented by *M. gale*. *From author's summary.*

169. Kalela, E. K. Männiköiden ja kuusikoiden juurisuhteista. I. **[The horizontal roots of Pine and Spruce stands. I.]** *Acta for. fenn.* 57 (2), 1950 (1951), pp. 68. 93 refs. [Fi.e.]

The investigation was carried out on 19 Spruce stands (aged 25–135 years) and 16 Pine stands (10–100 years). Roots were collected from the different soil layers to a depth of 40 cm. from plots 50 × 50 cm., sifted, and sorted into thickness classes. The length of the 3000 root samples was measured and they were weighed. In Spruce, the total length in 10-year-old stands is about 100 m./sq. m., and a maximum of 450 m./ sq. m. is reached at 100–110 years, followed by a decline, very slow at first. In Pine stands, a maximum of 370 m. is reached at 60–70 years, followed by a decline more rapid than in Spruce. The amount of roots less than 1 mm. thick declines from 100% of the length per sq. m. at first for both species to a level of about 60% from 30–130 years for Spruce, and to between 61 and 69% from 10 to 80 years and then to about 40% by 110 years for Pine. Roots 1–2 mm. thick increase rapidly in Spruce to about 20% in 10 years, then more slowly to 25% at 60–80 years, decreasing slowly thereafter; in Pine they increase steadily, being nearly as frequent as roots of less than 1 mm. at 110 years. Roots over 2 mm. thick form only 19% of the total in Spruce and 23% in Pine stands, while the figures for roots of over 5 mm. are 4·5 and 7% respectively. For both species about 87% of the roots are found in the top 20 cm., and at least 50% for Spruce and rather less for Pine are in the humus layer and the top 5 cm. of mineral soil. The roots are found within 10–20 years at all soil levels at which they are found in older stands. Roots of ground vegetation decrease as the tree roots increase, and increase again when the latter have passed their maximum. Roots 1 mm. thick are present in roughly the same amounts at all depths. Roots over 5 mm. in thickness decrease with increasing depth. The number of roots per cu.m. of standing tree volume decreases with age, rapidly at first and then more slowly. The average for mature Spruce

is 17,800 m. and for Pine 17,100 m./cu.m. Root density is highest in Spruce at 100–110 years (286 cm./cu. dm. of soil) and in Pine at 50 years (250 cm.). The root volume increases with stand age, reaching 2000–2500 c.c./sq. m. in old Spruce stands, or 0·5% of the soil volume. Root volumes for Pine and Spruce are almost equal, but the distribution at different levels varies considerably. The root systems of trees of each species increase steadily with age. A total length of 1000 m. is reached by Pine at 40 and by Spruce at 60 years, 2000 m. at 60 and 80 years, and 3000 m. at 75 and 95 years respectively. At 110 years the root systems are about equal and in Spruce they continue to expand. The root system of Spruce increases by over 40 m. per year between 60 and 110 years, reaching a maximum annual increment of 65 m. between 70 and 80 years, and that of Pine by over 40 m. between 40 and 90 years with a maximum of over 70 m. between 60 and 70 years. For trees the distribution of roots by soil layer and by thickness class is similar to that for stands. For trees of the same size Pine has a larger root system at first, the two are equal at a volume of 0·350 cu.m. and d.b.h. of 16 cm., after which Spruce has the more extensive root system. Results are given in graphs and tables with legends in both English and Finnish.

181.4. Reaction to Biotic Influences (Competition etc.) and Fire

See Nos. 48, 403.

181.5. Reproductive Behaviour

See also Nos. 83–6, 88, 97, 236 *et seq.*

170. Šimanjuk, A. P. Pričiny slabogo vozobnovlenija listvennicy Sukačeva. **[Reasons for the poor regeneration of Sukačev's Larch.]** *Dokl. Akad. Nauk SSSR* 66 (3), 1949 (479–82). 12 refs. [Russ.] A.P.B.

[Cf. *For. Abstr.* 11 (No. 925).] Data from Kostroma and Ivanov show that this species has low germinative capacity (20–30%) and energy, and seed from isolated trees was especially poor. In natural regeneration strips or groups of seedbearers should therefore be left; slash burning, and partial removal of litter or mixing it into the mineral soil are useful aids; mowing and grazing must be prohibited for at least 10 years after fellings. Seed collection should be from stands, not isolated trees.

171. Konev, G. I. Kedr v sosnovyh lesah Sibiri. **[*Pinus sibirica* in the Scots Pine forests of Siberia.]** *Bot. Ž.* 36 (4), 1951 (398–9). [Russ.] I.M.I.

Discusses examples of the occurrence of scattered trees and groups of *P. sibirica* in pure stands of *P. sylvestris* and of *Populus tremula*, on the foothills of the Sayan Mts. and on the W. Siberian plain, at considerable distances from any seed source, attributing their origin to seeds carried by nut-crackers and perhaps other birds. Includes some growth data from 14- to 31-year-old trees of *P. sibirica* growing as an understorey to *P. sylvestris*. In 30- to 100-year-old *P. sylvestris* with advance growth of *P. sibirica*, no regeneration of the former species was found.

172. Nelson, T. C. **A reproduction study of Northern White Cedar [*Thuja occidentalis*]; including results of investigations under Federal Aid in Wildlife Restoration Project Michigan 49-R.** Game Division, Department of Conservation, Lansing, Mich. 1951. pp. 100. 62 refs.

A detailed study was made of natural reproduction of *Thuja occidentalis* in swamps, and of the incidence and effect of browsing by deer, small rodents, and hares. Field and laboratory observations and experiments showed that germination of seed from swamps is low, though there is usually enough seed to assure adequate reproduction. Temperatures of 18° C. and below had an adverse effect on germination and seedling vigour. A trend of increase in germination with a decrease in hydrogen-ion concentration above pH 6·0 was apparent. Full sunlight inhibited germination, and partial light was more satisfactory than darkness. In field conditions logs in various stages of decay are the preferred germinating medium and seedlings upon them developed better root systems than those upon the swamp floor. About 8·5% of the seedling population was found to be killed, and 11·5% damaged by small-rodent and snowshoe-hare browsing. Of the mortality of advanced reproduction 2–8 ft. in height, 45% was due to deer and 20% to snowshoe-hare browsing.

Other subjects studied were natural regeneration by layering (aided by the presence of sphagnum moss), and the microclimate within decaying logs, and management to favour layering is suggested.

173. Gilbert, G. Contribution à la biologie des essences forestières congolaises. **[Contribution to the biology of tree species in the Belgian Congo.]** *Bull. Soc. Bot. Belg.* 84 (2), 1952 (289–96). [F.] O.B.D.

Gives the results of studies on the optimum germination conditions and requirements for early development of 9 species from the Yangambi region, viz. *Antrocaryon micraster*, *Autranella congolensis*, *Canarium schweinfurthii*, *Cola griseiflora*, *Drypetes gossweileri*, *Guarea cedrata*, *Pterocarpus soyauxii*, *Scorodophloeus zenkeri*, *Synsepalum subcordatum*.

181.6. Life Form, Habit. Post-Seedling Development and Form

See also Nos. 232, 331–2, 341–2.

174. Onaka, F. **The longitudinal distribution of radial increments in trees.** *Bull. Kyoto Univ. For.* No. 18, 1950 (1–53). 67 refs. [Jap.e.]

(1) In measurements on a large number of conifers the following results were obtained: (*a*) Inside the crown, annual ring breadth increases from the apex to the densest part of the crown and then remains constant or decreases slightly. (*b*) In the bole, growth distribution varies with the state of the crown; in trees with well developed crowns ring breadth increases steadily to the base; in trees with suppressed crowns restricted to a small part of the top of the stem, ring breadth decreases downwards; and in trees with medium-sized crowns, ring breadth decreases slightly or remains constant down to a height varying with the individual and the year, and below this it increases down to ground level. (*c*) In

most trees, except those with suppressed crowns, there is an abrupt increase in ring breadth in the butt. (*d*) The distribution of ring area is similar to that of ring width, but the maximum point for ring area in the crown is generally rather lower and the minimum point below the living crown, much higher, than that for ring width. (2) Pruning experiments were made to determine the effect of crown deformation on growth distribution, with the following results: (*a*) The removal of terminal buds and all side branches stopped radial growth in all parts of the stem except the butt, in which a few new wood elements were often still formed. (*b*) When all branches were removed except the leader, radial growth continued for some time only below the leader and near the base. (*c*) Excision of all buds was followed by retarded growth especially in the upper part of the stem. (*d*) Removal of branches on one side of the crown reduced the growth of the stem throughout its length by about one-half. (*e*) Removal of branches below the widest and densest part of the crown had little effect on stem growth, while pruning above that point was followed by reduction in radial growth below the pruned part. (*f*) Topping caused a rather large reduction in growth in the upper part of the stem. (*g*) When the stem was girdled, radial growth increased immediately above and decreased below the girdle. (*h*) When a closed stand was opened, radial growth increased especially towards the base of the trees. (3) In a study of auxin distribution in Pine the following results were obtained: (*a*) For buds in the same tree, the largest amount of auxin was found in the terminal bud. (*b*) Auxin content was higher in the corresponding annual ring in the stem than in the branches. (*c*) The upper branches in the crown contained more auxin than the lower. (*d*) In the basal part of suppressed lower branches, the auxin content decreased to zero. (*e*) Removal of branches was followed by reduction of auxin content in the stem below the pruning point. *From author's summary.*

175. ONAKA, F. **The effects of defoliation, disbudding, girdling and other treatments on growth, especially radial growth, of conifers.** *Bull. Kyoto Univ. For.* No. 18, 1950 (55–95). 40 refs. [Jap.e.]

Most of the experiments were carried out on young trees of *Pinus thunbergii* in the nursery of the Kyoto University Forests. In normal conditions radial growth generally began in the first week of April and continued until late October. The growth curve showed one maximum in April–May and another in August–September. The removal of all old leaves before the growing period, retarded radial growth until the young leaves had elongated; the same treatment after the young leaves were fully developed had no effect on growth. The removal of all buds, leaving the old leaves caused a reduction in growth later in the growth period. The removal of young leaves at midsummer caused a marked reduction in radial growth. The complete removal of buds and leaves throughout a tree stopped growth at once. After girdling, no woody layer formed below the girdle unless dormant buds developed. When developing buds or young leaves of a shoot were kept in the dark the radial growth of the shoot was checked but did not stop as long as the leaves were alive. When a terminal or branches were defoliated above a girdle the growth rate was reduced especially in the defoliated branch. The partial excision of buds caused an increase followed by a gradual decrease in growth. Decrease in radial growth caused by partial defoliation was not always proportional to the leaves removed; the removal of the upper leaves was more effective than the removal of the lower leaves. Results of an investigation on the behaviour of auxins are: (1) In buds, auxin appeared at the beginning of growth and increased with it. The maximum was found near the region of greatest growth. Considerable amounts were found throughout the growing season. (2) In stems, auxin was found to occur almost simultaneously in the upper part and in the buds, and to spread downwards. (3) The disappearance of auxin towards the end of the season began in the tip of young shoots and spread downwards. (4) If old leaves were left on, auxin did not entirely disappear when all buds and young leaves were removed. (5) When leaves and buds were kept in the dark the production of auxin was gradually reduced. When hormone pastes were applied, new wood elements were formed below the point of application. *From author's summary.*

176. BURGER, H. Holz, Blattmenge und Zuwachs. XI. Die Tanne. **[Wood, quantity of foliage, and increment. XI. Silver Fir.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 27, 1951 (247–86). 33 refs. [G.g.f.]

This study follows the same general lines as its predecessors dealing with other species [cf. *For. Abstr.* 13 (No. 157)], and is based on analysis of 88 trees of different ages and diameters from both even-aged and selection forest. The data, shown in graphs, relate to: (1) *Wood properties*—sp. gr. of sapwood and heartwood, green and dry; water and air content of dead and living wood; and shrinkage. (2) *Crown and foliage in relation to increment in individual trees*—with data on weight of twigs, weight and number of needles, and needle area; crown area; and correlations of these factors with d.b.h. and stemwood increment. (3) *Crown and increment relations in stands*—with data for a 56-year-old pure even-aged stand of Silver Fir, and for a mixed Silver Fir/Spruce/Beech selection forest.

177. MOLČANOV, A. A. Zapasy hvoi v sosnovyh drevostojah različnogo vozrasta. **[Needle weight in Scots Pine stands of different ages.]** *Dokl. Akad. Nauk SSSR* 67 (5), 1949 (909–12). 8 refs. [Russ.] A.P.B.

A report on needle-weight measurements made in August on a total of 107 felled sample trees from stands 13–150 years old (91 of the trees being from stands of full density), with some account of the statistical accuracy of the results. The sample taken per tree was 100% of the branchlets bearing needles for trees with a foliage weight of < 5 kg., 50% for those with 5–10 kg., and 20% for those with > 10 kg. Both fresh and oven-dry needle weights were determined. The latter are not given, but the moisture content of the needles is said to vary,

within the tree, with their age (max. in 1-year-old needles), to increase with increasing tree diameter in even-aged stands, and to show a maximum for middle-aged stands followed by mature stands and then by young ones. Tables give fresh needle weight per tree as related to d.b.h. and diameter increment; the wood volume produced in 3 years by 1 kg. of fresh needle weight, as related to age and d.b.h.; and estimated fresh needle weight for various ages and stand densities, in metric tons/ha. A straight-line correlation, which can be expressed by the equation $y = 495x + 0{\cdot}31$, is found to exist between fresh needle weight in kg. and volume increment in cu.m., respectively, irrespective of age and stand density, but with some divergence for the smaller-diameter trees within the younger age classes. [Cf. *For. Abstr.* 14 (No. 66).]

178. Stecki, K., and Rada, A. Szablastość strzał u modrzewi europejskich w nadleśnictwie Kwidzyń. **[Stem curvature of European Larch in the Kwidzyn forest district.]** *Acta Soc. Bot. Polon.* 21 (1/2), 1951 (165–79). 13 refs. [Pol.pol.e.] C.G.B.

Measurement of 212 stems (mostly 110–130, in one area 30–40 years old) of *Larix decidua* on 5 sample plots gave the following results: (1) stem curvature occurs very frequently in some stands; (2) of the stems measured 79·7% were curved; (3) curvature usually starts at a height of 5 m.; (4) the deviation from the vertical caused by curvature varies from 5 to 129 cm., the most frequent range of values being 10–30 cm.; (5) some stems show curvature in various directions (twists); (6) SE and E bends are the most frequent (54·8%) and NW and W bends the least frequent (3·2%); this roughly corresponds with the frequency of wind directions (predominantly westerly).

179. Goetz, J. Szablastość modrzewia polskiego na Górze Chełmowej. **[Curvature of *Larix decidua* var. *polonica* in Góra Chełmowa.]** *Acta Soc. Bot. Polon.* 21 (1/2), 1951 (181–90). [Pol.e.] C.G.B.

Measurements on 504 stems showed that 76% were curved in the E, NE, and SE directions, and 19% in all other directions, while 5% were straight or nearly straight. The prevalent winds (42·1%) are W. The curvature already appears in 2- to 3-year-old seedlings. Similar curvature was observed in Pine and Oak exposed to winds, while Larch shielded by other trees had straight stems. The loess soil of Góra Chełmowa lessens the resistance of Larch to wind action.

181.8. Phenology

See also Nos. 157, 633.

180. Elagin, I. N., Matveeva, A. A., and Zvorykina, K. V. Različija v razvitii rastiteljnosti v drevostojah iz ranneĭ i pozdneĭ form duba. **[Differences in the development of vegetation in stands of early- and late-flushing Oak.]** *Dokl. Akad. Nauk SSSR* 83 (1), 1952 (153–6). 6 refs. [Russ.] A.P.B.

A brief report on studies of reproduction, undergrowth and ground layers, on comparable plots in two types of Oak forest (*Quercetum graminosum* and *Q. rubosum*) in the valley of the river Khoper. Pure stands of both early- and late-flushing forms of *Quercus robur* occurred in both forest types. According to literature the maximum difference in flushing dates varies in this forest between 18 and 32 days. Results showed—as was expected from the differences of duration and intensity of the light received in spring—that the late-flushing stands had much more abundant and more vigorous reproduction of the dominant and associated woody species, more undergrowth, and a ground flora with many more species and a much greater total dry weight, than the early-flushing stands. Previous work is said to have shown that the wood of the late-flushing form is superior in technical properties. It is thus clear that silvicultural measures should favour this form.

181. Schans, D., and Soest, J. van. Wanneer groeien de bomen het hardst? **[When do trees grow most rapidly?]** *Ned. Boschb.-Tijdschr.* 24 (7/8), 1952 (179–91). 12 refs. [Du.du.g.] (*Korte Meded. Bosbouwproefsta. T.N.O., Wageningen* No. 13.)

Weekly measurements of diameter and height growth were made between April and October 1951 on 4–10 trees each of 6- and 46-year American Oak, 6-, 14- and 21-year Japanese Larch, 5-, 17-, 19- and 30-year Douglas Fir and 17-year *Abies grandis*. Results are shown in graphs, and diagrams are given showing for each species and age group the dates when growth began, and reached 25, 50, 75 and 100% of its total, and the dates of the different stages of leaf development. Growth began towards the end of April and ended late in September, and the main growth took place between mid-May and 1 August. These results are compared with corresponding dates for England and Germany.

182. Ciampi, C. Evoluzione della cerchia legnosa in *Castanea sativa* Mill. **[The development of the annual ring in *C. sativa*.]** *Nuovo G. bot. ital.* (*n.s.*) 58 (2), 1951 (271–92 + 20 photos). 4 refs. [It.it.e.] A.P.B.

Cf. *For. Abstr.* 12 (Nos. 2993–4).

183. Ciampi, C. Evoluzione della cerchia legnosa in *Quercus suber* L. **[The development of the annual ring in *Q. suber*.]** *Nuovo G. bot. ital.* (*n.s.*) 58 (2), 1951 (293–304). 5 refs. [It.it.e.] A.P.B.

184. Paolis, D. de. Accrescimento e cerchia legnosa annuale in *Quercus troiana* Webb, *Q. pubescens* W. e *Q. coccifera* L. in Puglia. **[Growth and annual-ring formation in *Q. troiana*, *Q. pubescens* and *Q. coccifera* in Apulia.]** *Nuovo G. bot. ital.* (*n.s.*) 58 (2), 1951 (386–93). 2 refs. [It.it.e.] A.P.B.

The first two species form regular annual rings, but the annual ring is not recognizable in *Q. coccifera*.

182. *Synecology, Plant Sociology: General, Principles and Methods*

182.1. Palaeoecology. History of Vegetation

See also No. 155.

185. Kac, N. Ja. K posleledníkovoĭ istorii širokolistvennyh porod v Evropeĭskoĭ časti SSSR. **[The post-glacial history of broadleaved species in Russia-in-Europe.]** *Dokl. Akad. Nauk SSSR* 81 (1), 1951 (85–8). 20 refs. [Russ.] A.P.B.

186. Zozulin, G. M. Ostatki borealjnoĭ rastiteljnosti v lesah gosudarstvennogo centraljno-černozemnogo zapovednika. **[Relicts of boreal vegetation in the forests of the Central Chernozem Reserve.]** *Bot. Ž.* 36 (4), 1951 (404–7). 6 refs. [Russ.] I.M.I.

The presence of some boreal species in the reserve, and of Pine pollen in bogs 50 km. to the south, is put forward as evidence in favour of the view that Pine forest of a boreal type formerly existed in Kursk Province. The forests of the reserve are thought to have passed through 3 phases: open Birch wood; boreal forest dominated by Pine; several-storeyed Oak wood, now generally reduced by human interference to single-storeyed Oak wood.

187. Yamazaki, T. **Studies on changes in the forests and climate in southern Saghalien and Hokkaido as shown by pollen analysis.** *Bull. Kyoto Univ. For.* No. 21, 1951. pp. 79. 184 refs.

182.2. Succession, Alternation and Periodicity in Vegetation

See also Nos. 31, 50, 211, 466–8.

188. Kalela, E. K. **Ecological character of tree species and its relation to silviculture.** *Acta for. fenn.* 57 (1), 1949 (1951), pp. 35. 52 refs. [E.e.fi.]

Discusses plant competition, studies of succession in Finland and elsewhere, and the conceptions and characteristics of pioneer and climax species in relation to silviculture, especially the introduction of exotic species, the thinning of even-aged stands, and the regeneration of the more valuable climax species.

189. Simak, M. Untersuchungen über den natürlichen Baumartenwechsel in schweizerischen Plenterwäldern. **[Studies of natural succession in Swiss selection forests.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 27, 1951 (406–68). 35 refs. [G.g.f.]

A study based on data from 20 sample plots in different forests, all in the natural transition zone between the Fir/Beech type and the pure Spruce type, confirmed the reality of succession in this region. It was also established that there was a typical vegetation characteristic of Spruce sites, and another characteristic of Fir sites, the difference between the two being largely a matter of the relative frequency of species. The possibility of using these differences as an indication of the suitability of a site for Fir or Spruce, is discussed in detail.

Comparison was made of 3 degrees of illumination and 3 degrees of soil moisture on Spruce and on Fir sites, in an attempt to determine the climatic factors involved in succession, but without positive results.

190. Navalkar, B. S. **Succession of the Mangrove vegetation of Bombay and Salsette Islands.** *Journal of the Bombay Natural History Society, Bombay* 50 (1), 1951 (157–60 + 2 plates). 4 refs. O.R.S.

The different stages in the Mangrove succession are traced. Nearness to the sea and the consequent degree of soil salinity, together with interference from man, are the chief factors influencing the succession. [Cf. *For. Abstr.* 13 (No. 1941).]

191. Bard, G. E. **Secondary succession on the Piedmont of New Jersey.** *Ecol. Monogr.* 22 (3), 1952 (195–215). 45 refs.

A study of succession on abandoned fields showed that they are invaded by *Juniperus virginiana* in the first few years and this is the dominant tree species for more than 60 years. Most of the species of the Oak/Hickory forest then enter the succession and are in the understorey by the 60th year.

192. Brenner, L. G., Jr. **Forest quadrat studies at the Arboretum and observations on forest succession.** *Ann. Mo. bot. Gdn.* 39 (2), 1952 (165–72). O.B.D.

A detailed report on changes in vegetation over a period of 12–15 years on quadrats established in the Forest Preserve of the Missouri Botanical Garden Arboretum at Gray Summit [cf. *For. Abstr.* 13 (No. 1968)]. The study shows clearly that most species are unable to invade established associations except in the event of some catastrophe such as fire, logging, heavy grazing or abrupt climatic changes of considerable duration. Most of the species invading the associations studied originated in the years following a considerable period of drought. The nature of such invasions depends mainly on the kind of seed immediately available, and its germination and survival requirements.

193. Roach, A. W. **Phytosociology of the Nash Crater lava flows, Linn County, Oregon.** *Ecol. Monogr.* 22 (3), 1952 (169–93). 28 refs.

The three principal associations studied were the *Aceretum circinati lavosum*, *Pseudotsugeto-abietum lasiocarpae*, and *Pseudotsugeto-abietum grandis*.

194. Saharov, M. I. Glavneĭšie faktory regulirujuščie smeny aspektov v lesnyh cenozah. **[The chief factors governing the change of seasonal aspects in forest biocoenoses.]** *Dokl. Akad. Nauk SSSR* 82 (3), 1952 (461–4). 8 refs. [Russ.] A.P.B.

182.4. Layer Communities

See No. 180.

182.5. Synecological Measurements and Methods

See also No. 29.

195. Sappa, F. Illustrazione ed esemplificazione sui querceti delle Langhe di un metodo biocenotico proposto da E. Schmid. **[A study of the *Querceta* of the Langhe of Piedmont as an illustration of the biocoenotic method of Schmid.]** *Nuovo G. bot. ital.* (*n.s.*) 58 (2), 1951 (195–236 + 1 tbl.). 18 refs. [It.it.e.] A.P.B.

An exposition of phytosociological method. The *Quercus* communities studied occur in the overlap between the *Q. pubescens* zone and the *Quercus/Tilia/Acer* zone, and analysis of their vegetation leads to the conclusion that they belong to the latter.

196. Bharucha, F. R. **Vegetation cartography.** *Indian For.* 78 (6), 1952 (305–10). 2 refs.

Discusses Gaussen's and Braun-Blanquet's systems of representing vegetation types etc. on maps, and the possibility of adapting them to Indian conditions.

182.8. Ecology of Artificial (Cultivated) Plant Communities

197. Roisin, P. À propos de deux chênaies d'origine artificielle. [**Two Oak woods of artificial origin.**] *Bull. Soc. for. Belg.* 59 (6), 1952 (265–95 + 1 photo). [F.]

An ecological study of two Oak plantations established some 60 years ago on abandoned fields in the Gaume region of Belgium. Figures of volume, girth, height, taper and total yield are given for both woods.

187. *Vegetation Types*

See also Nos. 9–12, 21–4, 26–32, 51, 55, 133, 172, 190, 195–6, 317, 401.

198. Salisbury, Sir E. **Downs and dunes: their plant life and its environment.** G. Bell & Sons, Ltd., London. 1952. pp. xiii + 328 + 74 photos. Price 45*s*.

Includes a chapter on Beech woods.

199. Tansley, A. G. **Oaks and Oak woods** [**in Britain**]. *Field Study Books*, Methuen, London. 1952. pp. 50 + 4 plates. Price 9*s*. 6*d*.

Consists of chapters on: structure of the Oak trunk; qualities and uses of Oak; parasites on the Oak; distribution of the two Oaks; Oak-wood soils; and types of Oak wood.

200. Duchaufour, P. Le climax du sol de la chênaie atlantique française. [**The soil climax in the French Atlantic Oak forest.**] *Schweiz. Z. Forstw.* 103 (6/7), 1952 (201–11). [F.g.]

Cf. *For. Abstr.* 11 (No. 2561).

201. Bolós, A. de, and Bolós, O. de. Sobre el robledal del llano de Olot (*Isopyreto-Quercetum roboris*). [**The Oak forest of the Olot plain (*Isopyreto-Quercetum roboris*).**] *Collectanea Botanica, Barcelona* 3 (1), 1951 (137–45). [Span.] O.B.D.

202. Onno, M. Der heidelbeerreiche Föhren-Stieleichenwald bei Krumpendorf in Kärnten. [***Pinus sylvestris*/*Quercus robur* forest with abundant *Vaccinium myrtillus* near Krumpendorf in Carinthia.**] *Ber. dtsch. bot. Ges.* 65 (1), 1952 (9–14). 12 refs. [G.] O.B.D.

An ecological study.

203. Ssorin, V. A. Pihtovye lesa Verhneĭ Svanetii (po srednemu tečeniju reki Ingur). [**Fir forests of Upper Swanetia [Caucasia] (middle reaches of the Ingur river).**] *Bot. Ž.* 36 (5), 1951 (468–96). [Russ.] C.G.B.

[Cf. *For. Abstr.* 13 (No. 2873).] Describes the natural conditions of the region and its subdivisions: (1) North-eastern—mean annual temperature 6° C., rainfall 920–950 mm.; stands with Fir (*Abies nordmanniana*) dominant cover 37% of the forest area, the remainder being under Spruce (*Picea orientalis*; 9%), Pine (*Pinus sylvestris* var. *hamata*; 26%), Oak (*Quercus iberica*; 12%), considerable areas of mixed Spruce/Pine, and also some Oak/Beech (*Fagus orientalis*) and Birch/Aspen. (2) Central—mean annual temperature 11°, rainfall 1300 mm.; Fir and Spruce/Fir occupy 65%, and Beech 21%, of the forest area, while Pine occurs only in scattered localities. (3) South-western—mean annual temp. 14°, rainfall 2200 mm.; Beech predominates (67%) and there are stands of *Castanea sativa* (3·5%) and *Carpinus caucasica* (2% of the forest area). The timberline for the region lies at 2100–2200 m. Thirteen types of Fir forest and 4 of Beech forest are distinguished and described. Notes are also included on peculiar types presumed to have originated after avalanches; on the topographical distribution of the forest types, with special reference to altitude; natural regeneration in the various types; and some features of the Fir forests (site quality, soil and stand constitution).

204. Jedlovski, D. Prilog istraživanju areala bukve u Dalmaciji. [**A study in the Beech region of Dalmatia.**] *Šum. List* 76 (5/6), 1952 (160–4). 3 refs. [Croat.it.]

Describes the only site in the Sinj district having a stand composed of *Fagus sylvatica*, *Carpinus orientalis*, *Fraxinus ornus*, and *Quercus lanuginosa*.

205. Ueda, K. **The silvicultural study of forest vegetation types.** *Bull. Kyoto Univ. For.* No. 19, 1950. pp. 70. 160 refs. [Jap.e.]

Discusses the principal vegetation types of N. and S. Japan and their value as indicators of site quality.

206. Laughlin, K. **A classification of midwest forest types.** *Trees, Cleveland, Ohio* 12 (5), 1952 (12, 38–9).

A classification based on species composition of stands.

207. Brown, R. T., and Curtis, J. T. **The upland conifer/hardwood forests of northern Wisconsin.** *Ecol. Monogr.* 22 (3), 1952 (217–34). 46 refs.

An ecological study.

208. Oosting, H. J., and Reed, J. F. **Virgin Spruce/Fir [*Picea engelmanni*/*Abies lasiocarpa*] forest of the Medicine Bow, Wyoming.** *Ecol. Monogr.* 22 (2), 1952 (69–91). 77 refs.

A detailed ecological study.

209. Trochain, J. Nomenclature et classification des types de végétation en Afrique noire française. [**Nomenclature and classification of vegetation types in French tropical Africa.**] *Bulletin, Institut d'Études Centrafricaines, Brazzaville* (*n.s.*) No. 2, 1951 (9–18 + 10 photos, 1 set of drawings). 7 refs. [F.]

Proposes standard terms for describing vegetation types, defines them, and compares them with those used by other authors.

210. Aubréville, A. Le concept d'association dans la forêt dense équatoriale de la basse Côte d'Ivoire. [**The concept of 'association' in the equatorial rain forest of the lower Ivory Coast.**] *Bull. Soc. bot. France, Mémoires* 1950–51 (1951), (145–58). [F.] O.B.D.

Discusses problems arising from attempts to classify the vegetation of this region. [Cf. *For. Abstr.* 13 (No. 1068–9).]

211. Richards, P. W. **The tropical rain forest: an ecological study.** Cambridge University Press. 1952. pp. xviii + 450 + 15 plates. 16 pp. of refs. Price £3. 3*s*. 0*d*.

The first general account of this formation-type since that in Schimper's *Plant Geography*, bringing

together the results of the author's own studies in the three chief tropical regions—S. America, Africa, and Malaysia [see *For. Abstr.* 1 (82, 148); 3 (105); 7 (Nos. 118, 133); 12 (No. 1797)]—and a great deal of information hitherto scattered in literature. After a general introduction dealing with the biological spectrum of the rain forest, its present and past distribution, and its significance for ecology, the work is divided into 6 parts: (I) Structure and physiognomy, with chapters on structure (synusiae and stratification), regeneration, physiognomy of the trees and shrubs, and ground herbs and dependent synusiae. (II) The environment—climate, microclimates, seasonal changes, and soil conditions. (III) Floristic composition of climax communities (primary rain forest). (IV) Primary successions—the primary xerosere and the recolonization of Krakatau; hydroseres; and coastal successions. (V) Tropical rain forest under limiting conditions—rain forest, deciduous forest and savanna; tropical rain forest at its altitudinal and latitudinal limits. (VI) Man and the tropical rain forest—secondary and deflected successions. A short postscript is devoted to some reflections on the future of the tropical rain forest, with emphasis on the possible consequences of exploitation or destruction and on the need for conservation. There are numerous illustrations and two indexes: (1) to plant names; and (2) general—a combined subject index and index to authors quoted.

212. FANSHAWE, D. B. **The vegetation of British Guiana: a preliminary review.** *Inst. Pap. imp. For. Inst., Oxf.* No. 29, 1952. pp. 96 + 10 photos. 43 refs. Price 10*s*.

The types studied are rain forest, seasonal forest, dry evergreen forest, montane forest, marsh forest and swamp forest.

213. BROWNE, F. G. **The Kerangas of Sarawak.** *Malay. Forester* 15 (2), 1952 (61–73). 5 refs.

Describes the vegetation of the *Kerangas*, sandy, excessively acid soils covering numerous scattered areas in Sarawak. They occur chiefly as coastal belts, as small, dry areas in the peat-swamps, on undulating country behind the swamps and on the gentler slopes of ridges and hills up to 3000 ft. They carry timber of variable quality, the trees being rather smaller than those found on better soils. Details of regeneration resulting from the clear-felling of a typical area are given: the most typical form of secondary *Kerangas* forest consists of dense, almost pure stands of *Archytaea vahlii*.

214. HATHEWAY, W. H. **Composition of certain native dry forests: Mokuleia, Oahu, T.H.** *Ecol. Monogr.* 22 (2), 1952 (153–68). 24 refs.

An ecological study of the semi-deciduous seasonal, and evergreen seasonal forests of Hawaii. These are remarkable for the large number of species present, an annotated list of which is given.

2. SILVICULTURE

See also Nos. 188, 889.

215. KITCHINGMAN, G. D. **An outline of French silvicultural literature.** *Forestry* 25 (2), 1952 (135–42).

Notes on the principal silvicultural classics of France.

216. BOYD, H. [Compiler]. **Management of upland hardwood.** Southern Forest Experiment Station, New Orleans, La. 1951. pp. 23.

A list of American references from 1901 to 1951.

217. LEBARRON, R. K. **Silvicultural practices for Lodgepole Pine in Montana.** *Sta. Pap. Nth. Rocky Mt. For. Range Exp. Sta.* No. 33, 1952. pp. 19.

Discusses general management, watershed management and silvicultural problems (response to partial cutting, arrangement and size of clear-felled blocks, regeneration, stand improvement, and slash disposal) and makes recommendations for silvicultural practices, including timber marking, slash disposal, stand improvement and erosion-prevention measures.

218. DURGNAT, P. A. **Swamp forests in lower Perak.** *Malay. Forester* 15 (3), 1952 (127–31).

Describes and discusses the method of working these forests in which the most important species is Meranti Bakau (*Shorea rugosa*). Extraction has to be done on tramways laid over the swamp on a cribwork of poles and round sleepers. Ample regeneration is obtained after felling. The possibilities of cleanings and thinnings are discussed. A rotation of 70 years is desirable.

219. PICCAROLO, G. Il pioppo: norme pratiche de coltivazione. **[The Poplar: practical rules for its cultivation.]** Ramo editoriale degli agricoltori, Rome. 1952. pp. 130 + 30 photos. [It.]

Covers choice of species, propagation, planting, injuries and protection, utilization, and economic aspects, of Poplar growing in Italy. [Cf. *For. Abstr.* 14 (Nos. 147–8).]

22. SILVICULTURAL SYSTEMS. CONSTITUTION AND COMPOSITION OF STANDS; FORMS OF STAND

221. *High Forest Systems*

See also Nos. 53, 189, 237–8, 243–4, 247, 565–6.

220. NEFF, L. P. **A comprehensive cutting study in swamp Black Spruce.** *Pulp Paper Mag. Can.* 53 (6), 1952 (167 . . . 172).

A brief account of experiments in progress on 160 acres of pulpwood stands on the Big Falls Experimental Forest of the Lake States Forest Experiment Station on clear felling in strips or patches, shelterwood and a light partial felling. [Cf. *For. Abstr.* 14 (No. 242).]

221. LONGWOOD, F. R. **Heavy mortality does not always follow partial cutting of Hemlock/hardwood stands.** *J. For.* 50 (7), 1952 (558–9).

Observation of 198 trees selected at random along a 40-chain line in a stand from which 70% of volume had been removed, showed that only 5 trees died as a direct result of exposure or shock and 12 others suffered windthrow, in the 7 years following logging. Most of these were Hemlock.

222. LESAGE. La forêt domaniale de Lyons. (Coup d'oeil rétrospectif). **[The state forest of Lyons [in Normandy]. A glance backwards.]** *Rev. for. franç.* 1952 (7/8), (489–99). [F.]

Gives an account of the history and management of this Beech forest which, since 1865, has been managed on the uniform system with fixed periodic blocks.

222. *Coppice, Pollarding and Lopping Systems*

See Nos. 223, 248, 550.

226. *Changes of Silvicultural System. Conversion (by System or Species)*

223. MORMICHE, A. Amélioration des taillis sous futaie sur sol calcaire en Lorraine. **[The improvement of [degraded] coppice-with-standards on calcareous soils in Lorraine.]** *Bull. Soc. for. Franche-Comté* 26 (6), 1952 (327–30). [F.]

Proposes a mixed method, in which the better areas would be treated by the usual conversion measures, and the worse ones clear-felled and planted with conifers.

228. *Constitution and Composition of Stands; Forms of Stand. Tree Classes*

See also Nos. 331–2, 562.

224. HUET, M. Nocivité des boisements en épicéas (*Picea excelsa* Link.) pour certains cours d'eau de l'Ardenne belge. **[The harmful effect of pure Spruce stands on certain streams in the Belgian Ardennes.]** *Bull. Soc. for Belg.* 59 (7), 1952 (321–8 + 3 photos). 3 refs. [F.]

The extensive even-aged Spruce woods which have replaced mixed broadleaved stands over large areas of the Ardennes, particularly in valley bottoms, have had most injurious effects on trout streams. Injury is caused both by poisoning and by shading of the water, so that aquatic vegetation and much of the fauna disappear, leaving neither shelter nor food for the fish population. The toxic action of Spruce is different on springs and streams of helocrene and of rheocrene origin. The former are invariably poisoned, but the latter, even when situated in extensive Spruce forests, appear to be immune if not actually shaded. The dense, permanent canopy of even-aged Spruce stands causes almost complete disappearance of aquatic vegetation and consequently of aquatic fauna in streams of both origins. It is suggested that a short-term measure to counteract these effects would be to clear a strip 5 m. wide on each bank of the larger water-courses (2 m. wide and above). The only long-term remedy would be to replace pure Spruce by mixed stands with a large proportion of broadleaved species. [Cf. *For. Abstr.* 14 (No. 39).]

225. KRAHL-URBAN, J. Buchen-Betriebszieltypen. **[Types of objective in managing Beech.]** *Forstwiss. Cbl.* 71 (3/4), 1952 (97–108). [G.]

A study of Beech management on the same lines as a previous study of Oak [cf. *For. Abstr.* 13 (No. 2008)]. The range of Beech and its silvicultural characters are considered, and the following types of stand are discussed: (1) Pure Beech, managed for sawtimber, (2) Beech/other high-quality hardwoods, managed for sawtimber, (3) Beech/Sessile Oak, managed for sawtimber, (4) Beech/Spruce, (5) Beech/Larch, (6) Beech/Pine, (7) Beech/Douglas Fir.

226. ATTENBERGER, J. Mischwuchs-Fragen im Bayrischen Oberland dargestellt an drei Bauernwaldbeständen. **[Problems of mixed stands in the Bavarian highlands, as represented by three farm forest stands.]** *Forstwiss. Cbl.* 71 (5/6), 1952 (129–41). 10 refs. [G.g.]

Presents observations on the composition, constitution, and ecological balance of 3 mixed stands: (1) an ideal mixture of Beech/Fir/Spruce, (2) a Spruce/Beech stand with some Fir, in which the Beech is subordinate in both numbers and dominance, and (3) a mixed Fir/Spruce stand, with a little suppressed Beech. The deterioration in the general ecological situation in stands where Beech is disappearing owing to human intervention, amply illustrates the importance of Beech in maintaining the ecological balance in the mixed forests of the foothills of the Alps in this region.

227. PRIEHÄUSSER, G. Beitrag zur Frage der Vorwüchsigkeit von Fichte und Buche im Bayrischen Wald. **[The question of the relative dominance of Spruce and Beech in the Bavarian forests.]** *Forstwiss. Cbl.* 71 (5/6), 1952 (169–81). 2 refs. [G.]

A study was made in a limited area of the Bavarian Alps in an attempt to find under what circumstances Beech predominates over Spruce and vice versa. Factors examined were: soil types; soil water and aeration; microclimate; % representation, root system, and regeneration of Beech, Spruce and associated tree species; and ground flora. It was evident that the relative dominance of the two species depends upon the site. Spruce prefers a soil which is consistently moist up to the surface, and well enough aerated to allow the tree to obtain nourishment through the shallow root system in the A horizon, and through sinker roots at greater depths. Beech outgrows Spruce on soils having only one horizon, where it can develop a deep root system with no impedance from compacted horizons. In the particular area studied optimum sites for Spruce were those with a superficial covering of soils derived by creep from the upper slopes. Sites preferred by Beech were those on steep slopes which had lost soil in this manner. Silver Fir is best suited by soils which are always moist up to the surface and which receive constant moisture from seepage from higher slopes.

228. SUSMEL, L. Stato normale delle abetine del Comelico. **[The normal state of the Silver Fir/Spruce stands of the Comelico.]** *Monti e Boschi* 3 (6), 1952 (243–51). [It.f.e.]

The normal state of uneven-aged Silver Fir/Spruce stands is calculated from inventories of the most

productive woods of the region. In a normal stand, so defined, density remains almost constant at a value permitting good illumination of the soil.

229. KÅSA, J. Lauvtrærnes rolle i granbestand. [**The part played by hardwoods in Spruce stands.**] *Tidsskr. Skogbr.* 60 (6/7), 1952 (129–46). 17 refs. [Nor.]

Quotes figures showing the yield and value of different hardwood and softwood species and concludes that although hardwoods are not economically so profitable a timber crop as softwoods, their part in maintaining favourable soil conditions is sufficient to justify planting mixed hardwood and softwood stands rather than pure Spruce in Norway.

230. TIKKA, P. S. Perä-Pohjolan koivikoiden laadusta. [**The character of Birch stands in North Finland.**] *Acta for. fenn.* 57 (4), 1950 (1951). pp. 34. 17 refs. [Fi.g.]

Gives particulars of stand structure, branchiness, stem form and defects in pure and mixed stands in different vegetation types. More satisfactory production of timber for industry can be achieved by better choice of site. Mixed planting or underplanting with Spruce is recommended for the best sites. [Cf. *For. Abstr.* 12 (No. 2852).]

231. SÖDERSTRÖM, G. V. Björkens behandling som skogsträd i Norrland. [**The treatment of Birch as a forest tree in Norrland.**] *Norrlands SkogsvFörb. Tidskr.* 1951 (2), (125–35). [Sw.]

Discusses species found in Norrland, the site requirements, age and dimensions reached, and light requirements of *B. pubescens* and *B. verrucosa*, yields in pure stands and mixed stands (Pine/Birch, Spruce/Birch, and Pine/Spruce/Birch), management, pruning and regeneration. Use of Birch in mixed stands, in proportions of 30–40% by volume, is particularly recommended.

232. CITOVSKAJA, I. L. Vyživaemostj derevjev v sosnovolipovom nasaždenii. [**Tree survival in a Scots Pine/Lime plantation.**] *Dokl. vsesojuz. Akad. sel.-hoz. Nauk Lenina* 16 (12), 1951 (12–19). 1 ref. [Russ.] A.P.B.

Tabulates and discusses records, made during inspections at various ages (the last in 1950) of survival and growth of [unthinned?] mixed Scots Pine/Lime [*Tilia cordata*?] and pure Scots Pine plantations made in 1879–80 in the experimental forest of the Timiryazev Agricultural Academy, Moscow Province. The mixed plantations were formed by planting alternate rows 1·1 m. apart with 3-year-old Pine and 4-year-old Lime, both spaced 2·2 m. apart in the rows but staggered so that any one plant of either species stood at the centre of a square with a plant of the other species at each of its corners. The pure Pine was planted 2·13 m. square spacing in one case and at a closer spacing [not specified] in the other. Results show that: (1) Variation in tree diameter in the mixed stand decreased with age; in youth the coefficient of diameter variation for Lime was twice that for Pine, and with increasing age it decreased faster, so that by 73 years there was little difference between the two species in this respect. (2) At all ages more trees survived in pure Pine than in the mixed stand, where natural thinning was more rapid and growth of the Pine faster. From early youth on, Pine formed the top storey, with the Lime continuing as an understorey. A comparison shows that the behaviour of Pine in the mixed stand is an effect of the mixture and not of density, since in the denser pure Pine diameter growth was retarded. The mixed stand at ca. 70 years old had a stocking/ha. of 410 cu.m. Pine + 90 cu.m. Lime, the mean height of the Pine being 23 m.; the pure stand at comparable spacing had a volume of 428 cu.m. and height of 26 m. Further, the Pine in the mixed stand showed better natural pruning, and both Pine and Lime were of good quality. (3) A plan of the mixed stand is included to show that groups rather than individuals tend to survive or die [cf. *For. Abstr.* 11 (No. 769)]. Where Pine grew specially well, no Lime in the group survived, but where diameter growth of both species was moderate, both survived. Natural thinning of Pine was most intense in the first 30 years, whereas that of the Lime took place chiefly in the last 30 years.

233. KAGIS, I. **Some problems of mixedwood stands.** *For. Chron.* 28 (2), 1952 (6–18).

Analysis of growth data for the mixed White Spruce/Aspen type which constitutes a large part of the forest stands of Saskatchewan indicated that the valuable Spruce suffers much mechanical damage by whipping from the faster growing Aspen: 48·4% of trees had damaged tops, and 9·5% damaged limbs, a total of 57·9%. It was also found that the curves for c.a.i. and m.a.i. cross at the following ages: 57 years for pure Spruce, 41–42 years for pure Aspen, and 38–39 years for Spruce/Aspen stands. The last of these figures is unexpectedly low, and is attributed partly to the fact that it is at about 30 years of age that the tops of Spruce usually begin to grow into the crowns of the Aspen and therefore to suffer the mechanical damage mentioned above. Even at the age of 80 years White Spruce responds to release, and it is suggested that the best way of managing these mixed stands, at any rate on the better sites, would be by a release cutting at about 30 years, and a second release cutting, combined with removal of badly formed Spruce, when the Aspen is about 70 years old and becoming subject to heart rot. The economic aspects of such a system are discussed.

234. SCHOLZ, H. F. **Age variability of Northern Red Oak in the upper Mississippi woodlands.** *J. For.* 50 (7), 1952 (518–21). 7 refs.

Analysis of more than 3000 increment cores from mature trees in pure, apparently even-aged stands of *Quercus borealis*, confirmed the even-aged character of the main stand. The maximum difference in age varied from 10 to 30 years. The possible application of this characteristic to regeneration of these stands is discussed.

235. GODMAN, R. M. **A classification of the climax forests of southeastern Alaska.** *J. For.* 50 (6), 1952 (435–8). 11 refs. [Alaska Forest Research Center, Juneau, Alaska.]

A classification for these forests was needed to show the characteristics of the present stands and to aid in estimation of yields of the second growth

that will follow cutting. 'Log height', i.e. average number of 16-ft. logs to a 6-in. top diam. u.b. of trees of the average stand diameter and larger, was found to be the most practical single indicator of stand characteristics in the climax forests. The stand of more than average diameter represents at least $\frac{2}{3}$ of the gross volume and $\frac{1}{3}$ of the stems. Log-height is roughly indicative of species composition, gross volume, and average diameter, and is easily recognized and measured in the field. Five log-height classes represent the range of sites; average volume/acre differs significantly between classes, the larger volumes occurring in the higher classes. Climax forests are defective; about $\frac{1}{2}$ the gross volume is cull in the poorest stands and about $\frac{1}{3}$ in the better stands. Diameter growth averages 0·08 in./yr. with no significant differences between species, crown classes, log-height, or age groups. The best net volume growth in climax stands (averaging slightly over 50 cu. ft./acre/year) is less than that on the poorest second-growth site. *From author's summary.*

23. REGENERATION AND FORMATION OF STANDS

See also Nos. 234, 605.

236. MACÍAS ARELLANO, L. Reforestación—teoría y práctica. [**Reforestation—theory and practice.**] Dirección General Forestal y de Caza, Secretaría de Agricultura y Ganadería, Mexico. 1952. pp. 330. 29 refs. [Span.]

A comprehensive work containing chapters on: general principles of reforestation, choice of system, choice of species, characteristics of pure and mixed stands, the collection, extraction and storage of seed, determination of seed quality, forest nurseries, preliminary treatment of reforestation areas (including dunes), reforestation by direct sowing and by planting, spacing, planting methods, protection of reforested areas, and planning for reforestation.

237. LØFTING, E. C. L. Rødgranplantagernes foryngelse i de jydske hedeegne. 1. del: Foryngelsesproblemerne. [**Regeneration of Norway Spruce in the Jutland heath areas. Part 1. The problems of regeneration.**] *Forstl. Forsøgsv. Danm.* 18 (3), 1949 (327–83). [Dan.e.]

From 1907–1928, regeneration was carried out in mature first-generation Spruce on fairly good heath soil in the Palsgaard forest district mainly by clear felling and planting; the results were disappointing because of the heavy attacks by *Hylobius abietis* and other insects, the dense covering of *Deschampsia flexuosa*, and damage by drying out and from night frosts, while there were long periods of check, much beeting up was needed, and there was much windthrow in the old stands on the exposed side of the clear fellings. From 1928, a modified progressive clear-strip system was used, in which a narrow (12–18 m. broad) strip was felled, running east-west, starting on the eastern edge of the stand, and extended at 3- to 4-year intervals, when the new plantations were well established, by strips of the same width and length, one on the S. and one on the W. margin of the original strip. Repetition of such fellings produces a regeneration area with strips in echelon forming a rough wedge advancing eastwards at its apex and southwards along its stepped southern margin, each new planting strip being sheltered and shaded by a northern margin of the old stand, which is not exposed to windthrow. By this method beeting up was reduced from 97 to 21%, and periods of check, heavy attacks by *H. abietis* and serious wind damage have been avoided. It has been found in practice that the breadth of the strip under regeneration should not exceed $\frac{2}{3}$ the height of the mature stand to the south of it. If wider strips are cut, their northern edge is liable to invasion by *D. flexuosa*, to greater fluctuations in temperature and to attack by *H. abietis*. *H. abietis* was found to be present in large numbers on the strips under regeneration, and freedom from attack is attributed to the good physiological condition of the young trees, resulting from the favourable microclimate. If the plantations are exposed to insect attack by clear felling, windthrow or fire damage, direct control may be necessary. Spraying with a solution of 400 g. lead arsenate, 800 g. slaked lime and 100 g. 'cold glue' in 100 litres water has given good results, and experiments with DDT preparations are being made. Soil analyses and an examination of the ground flora show that organic matter accumulated in the humus layer is made gradually available in the soil proper, to the benefit of the new stand, and humus accumulation does not start again until the stand closes (after 6–8 years). At Palsgaard, Norway Spruce on the strips reaches a height of 3·5 m. in 10 years, while corresponding plantations on clear-felled areas are still in check. Norway Spruce is the main species used on the strips, sometimes mixed with Douglas Fir and other species, and interspersed with clumps of Japanese Larch, which may be under-planted later with hardwoods, Silver Fir etc. A study of costs shows that plantations on clear-felled areas, because of the check period and the need for beeting and insect-control, are more expensive than those made under this strip system.

238. OKSBJERG, E. Rødgranplantagernes foryngelse i de jydske hedeegne. 2. del: Underplanting, selvsåning og renafdrift. [**Regeneration of Norway Spruce plantations on the heaths of Jutland. Part 2: Underplanting, natural regeneration and clear felling.**] *Forstl. Forsøgsv. Danm.* 20 (3), 1951 (165–228). 40 refs. [Dan.e.]

Scandinavian research on the relationship between nitrification and temperature, moisture, and acidity, in the humus layer of Norway Spruce stands is discussed. Special emphasis is laid upon the rôle of *Deschampsia flexuosa*, which has a dense root mat that absorbs rain and prevents its entry into the soil, and leaves that afford no protection against heating and desiccation of the soil surface. To prevent invasion of regeneration areas by *Deschampsia flexuosa*, regeneration should be undertaken before the canopy becomes too open. With clear felling, the raw-humus layer should be covered as soon as possible, to prevent heating and desiccation and consequent reduction in nitrification, by harrowing in (before or after felling), leaving brushwood on the site and possibly by sowing a cheap leguminous cover crop. With regeneration by underplanting,

the shelterwood should be retained as long as possible so that the new crop is well established before *D. flexuosa* can come in. If extensive opening of canopy or windthrow should occur, the original underplanting with a shade - bearing, drought-resisting species (usually Silver Fir in Denmark) should be supplemented with fast growing species, such as Birch or Larch. On the heath plantations the limiting factor in choosing a species for underplanting is water rather than light. Pioneer species for grass-covered soil must be drought-resistant and frost-hardy. *Pinus sylvestris*, *P. contorta* and, where there is less danger of late spring frost, Japanese Larch, *Alnus glutinosa* or the polypoid *A. spuria* can be used. Natural regeneration of Spruce often takes place on heathlands but the seedlings often die of drought during their first year. When a good self-sown stand does develop it is seldom used, as growth check and the need for thinning are thought to make such stands unprofitable, but the introduction of fast-growing species, e.g. Scots Pine, Larch, or Birch, will stimulate the checked trees into growth, and may well pay. The use of a flame-thrower during periods when fire danger is low is recommended for heavy thinning in dense self-sown stands.

239. Cooper, R. W. **Regeneration problems in Sand Pine [*Pinus clausa*].** *Sth. Lumberm.* 184 (2303), 1952 (43–4).

Discusses problems of regeneration in the 'Big Scrub' area of north-central Florida [cf. *For. Abstr.* 13 (No. 2838)]. Stands cut over in the spring will probably need direct sowing after the period of drought (February–April) to ensure regeneration. Suitable post-logging treatments include lopping the tops of felled trees and scattering the branches on cut-over areas, and disking, which reduces the rodent population and covers some of the seed in the ground. Neither of these treatments, nor a combination of the two, is always dependable. In one test area, lopping and scattering resulted in 210 stocked milacres/acre, and disking, either before or after lopping and scattering, gave 400 milacres/acre. The desirable minimum is 500/acre. Dusting a chlordane mixture over 1-acre blocks gave 3–5 times more seedlings/acre than in corresponding blocks where ants had not been controlled. A rolling brush-cutter seemed to be more effective than a disk for getting seeds into mineral soils. Both treatments were confined to alternate strips 8 ft. wide, to reduce cost per acre. Direct sowing showed some success. Sound Pine seed has germinated from depths of 1 in., but $\frac{1}{4}$–$\frac{1}{2}$ in. below the surface is the optimum. June to December is the best sowing season. Effective control of ants and rodents is essential.

240. **[Regeneration of] tidal forests.** *Rep. For. Res. W. Bengal 1948/49*, 1951 (2–3).

An area of some 500 acres of tidal forest in Alampur was protected from damage by man and cattle, and there was a marked difference in appearance between the crop here and in adjacent, unprotected areas subjected to heavy grazing. Seeds of *Ceriops roxburghiana*, *Carapa moluccensis* and *C. obovata* were dibbled in at a 6 × 6 ft. spacing on parts of the protected area and grew remarkably well along the banks of creeks but poorly inland; germination averaged 70%. Broadcast sowing of these species was unsuccessful but broadcast sowings of *Avicennia alba* and *A. marina* germinated fairly well. In general, it is concluded that reforestation of tidal swamps would succeed, provided that good, fresh seed were used, and cattle rigidly excluded.

231. *Natural Regeneration*

See also Nos. 170–2, 180, 238–9.

241. Vaartaja, O. Alikasvosasemasta vapautettujen männyn taimistojen toipumisesta ja merkityksestä metsänhoidossa. **[The recovery of released advance growth of Scots Pine and its silvicultural importance.]** *Repr.* from *Acta for. fenn.* 58 (3), 1951. pp. 133. Many refs. [Fi.e.]

The material studied was from stands completely recovered after release and from recently released stands. Advance growth which had been suppressed for 25 to 60 years was found to have recovered completely after clear felling of the overstorey, but the response was not always immediate, and in needle length and shoot growth was sometimes negative, especially in damaged trees. Radial growth began to increase after release, sometimes during the first season. Height growth increased more slowly and later. The root system spread rapidly. In comparison with normal stands (natural and artificial), released stands grew slowly at first, and then at a normal rate. Recovery was more rapid among younger, less stunted trees on better sites. The quality of released advance growth was poor at first but improved as recovery continued. Common defects such as bushy branching, bends, and compression wood, occurring during suppression or recovery, were confined mainly to the stump when low advance growth was released but were more serious on the main part of the stem in advance growth, released when it was taller. It was found that satisfactory regeneration was possible from advance growth when this was dense and even. Partial cutting generally had an unfavourable effect and the resulting stand was uneven. Young seedlings planted near release advance growth were hindered in their development, probably by the rapid root expansion of the released trees. *From author's summary.*

242. Buckman, R. E., and Schneider, A. E. **Regeneration following cutting in Black Spruce swamps.** *Minn. For. Notes* No. 3, 1952. pp. 2.

Cf. *For. Abstr.* 14 (No. 220).

243. Boyd, R. J. **Effect of harvesting methods on reproduction in the mountain Engelmann Spruce-Alpine Fir type.** *Res. Note Rocky Mt. For. Range Exp. Sta.* No. 11, 1952. pp. 2.

A survey made 5 years after felling in a block of four 8-acre plots treated respectively by alternate clear-strip felling, group selection, and single-tree selection, and left untouched, showed that: (1) with any of the three harvesting methods, advance growth surviving logging was sufficient to provide a well stocked stand, consisting mainly of Alpine Fir; (2) natural regeneration is rapid, and stocking nearly complete 5 years after logging, being highest

under group-selection and lowest in clear felling; and (3) with all methods of harvesting subsequent reproduction tends toward the more desirable, less tolerant Engelmann Spruce and Lodgepole Pine.

244. Longwood, F. R., and Salminen, W. A. **Reproduction after cutting in hardwood-Hemlock stands.** *Tech. Note Lake St. For. Exp. Sta.* No. 379, 1952. pp. 1.

A study, 10 years after treatment of regeneration on 3 stands, 1 clear felled, 1 partially felled and 1 untouched, showed for all stands an increase of Red Maple and Sugar Maple at the expense of Yellow Birch and Hemlock, which constituted 60% of all stems 5 in. d.b.h. and over in the old stands.

245. Arend, J. L., and Gysel, L. W. **Less Oak reproduction on better sites.** *Tech. Note Lake St. For. Exp. Sta.* No. 378, 1952. pp. 1.

A study of Oak stands in S. Michigan showed that reproduction of Black, Red and White Oaks ranged from 50% of the total tree reproduction on very poor sites to 4% on very good sites. On very poor sites 88% and on very good sites only 27% of the milacre plots contained at least 1 Oak seedling.

246. Ivanova, N. E. Rost jasenja obyknovennogo (*Fraxinus excelsior* L.) v širokolistvennyh nasaždenijah. [**Growth of Ash in broadleaved stands.**] *Dokl. Akad. Nauk SSSR* 66 (4), 1949 (717–20). 1 ref. [Russ.] A.P.B.

On clear fellings in an Oak/Ash wood in the Tellerman Forest, Voronezh, much advance growth of these two species was present, and coppice of other broadleaved trees and shrubs later appeared. Eight years later Ash was dominant in the reproduction, with Oak in the second storey. Examination showed that the vigorous growth of the Ash was at least in part a reaction to the seedlings having been cut back to stump at 2–3 years old when the felling site was cleaned up.

247. Pisano, E. Observaciones sobre la renovación del bosque de laurel y ulmo en la región del lago Llanquihue. [**Studies of regeneration in the *Laurelia sempervirens* and *Eucryphia cordifolia* forests in the region of Lake Llanquihue.**] *Agricultura téc., Santiago* 10 (1), 1950 (22–31). [Span.e.] A.P.B.

A study was made of regeneration in part of the forest of the 'Centinela' Experiment Station in Puerto Octay, Chile, to find whether certain types of forest can regenerate naturally after partial exploitation. The stands had been exploited in 1938–40 by methods resembling 'selective' logging. *Myrtus luma* and *Myrceugenia apiculata*, which are highly intolerant of shade, were found in considerable numbers; they were at the same time forming an environment unfavourable to themselves by reducing the light. *Laurelia sempervirens*, *Aextoxicon punctatum* and *Gevuina avellana* were found in numbers following this order. There were only a few shrubby species, including *Chusquea quila*.

248. **Pomarrosa sprouting studied.** *Carib. For.* 13 (1), 1952 (15,37–8). [E.Span.] (*Rep. U.S. trop. For. Exp. Sta.* 12 [1951?].)

A study was made of coppicing in *Eugenia jambos*, now thoroughly naturalized in Puerto Rico. Vigour of coppicing seems to be affected more by canopy opening than by stump diameter, though the larger the stump, the taller were the coppice shoots. Solitary stumps put out more shoots than those which formed part of an incompletely cut clump. Maximum amounts of fuelwood would therefore be obtained by clear felling and coppicing. Poisoning would probably be necessary to eradicate the trees.

232. *Artificial Regeneration*

See also Nos. 237–8.

249. Lynch, D. W. **Forest tree planting in the Inland Empire.** *Misc. Publ. Nth. Rocky Mt. For. Range Exp. Sta.* No. 5, 1952. pp. 22. 11 refs.

Discusses local planting problems, nursery practice, planting preparations, planting and costs.

232.1. Choice and Trial of Species, Races etc.

250. Galoux, A. Études des conditions de croissance des essences forestières américaines susceptible d'intéresser la sylviculture européenne. [**A study of the growing conditions of American forest species of interest for European forestry.**] *Revue de l'Agriculture, Bruxelles* 5 (6), 1952 (591–4). [F.] L.S.

Discusses the provenances and the value of *Pseudotsuga taxifolia*, *Tsuga heterophylla*, *Thuja plicata*, *Abies grandis*, *A. nobilis*, *Quercus borealis*, *Q. velutina*, and *Liriodendron tulipifera* for Belgian forestry.

232.11. *Species Trials (by Localities), including Forest Gardens, Trials of Exotics etc.*

See also Nos. 82, 319–21, 323, 548.

251. O'Kelly, P. F. ***Pinus contorta* as a forest tree in Ireland.** *Irish For.* 9 (1), 1952 (28–33). 4 refs.

Plantations of *P. contorta* var. *latifolia* were successfully established at Kilworth on peat overlying old red sandstone with iron pan, by mound planting on upturned turves. At 17 years average stems measure 28 ft. high and 3·4 in. b.h. quarter girth o.b. Together with thinnings, this gives a volume of 1930 cu. ft./acre at 17 years on a site where Scots Pine and Spruce were a failure.

252. Newman, T. **Silver Fir at Coryton, Devon.** *Quart. J. For.* 46 (3), 1952 (183–4 + 1 photo).

Abies alba has done very well on this estate, on high ground between Dartmoor and Bodmin Moor, and the owner has formed a collection of various species of Silver Fir, notes on the performance of which are given.

253. Aubert, C. G. Réflexions sur un essai d'exotiques dans l'Orne. [**A trial of exotics in the Department of Orne.**] *Bull. Soc. for. Franche-Comté* 26 (6), 1952 (232–7). [F.]

Gives tabulated data (mean merchantable height and merchantable volume) of 40- to 45-year-old test plots of *Thuja plicata*, *Cupressus lawsoniana*, *Larix leptolepis*, *Pseudotsuga taxifolia*, *Abies concolor*, *Juglans nigra*, *Fraxinus americana* and *Prunus serotina*.

254. Lipták, V. Skúmanie rasovej a provenienčnej otázky červ. smreka na Medzinárodnej pokusnej ploche na Podbansku. [**Larch provenance trials in the international experimental area at Podbansko.**] *Pol'ana* 7 (8/9), 1951 (158–70). [Slovak.]

This area of 77·688 ha. (altitude 950 m.) was established in May, 1946, in the Podbansko State Forest, in accordance with the resolution of the September, 1943, meeting at Štrbske Pleso (Slovakia) of the International Union. The area is divided into 150 experimental plots of 450 sq. m. each. Larch (*Larix decidua*, *L. leptolepis*, and *L. sibirica*) from 41 different European provenances, reared from seed at the Gregová, Biely Váh, nursery, were planted in these plots in 1946: Larch of home provenance (Tatra Larch) was planted as control on 43 plots. The spacing was 0·70 × 1·50 m., equivalent to 400 plants per plot, or 60,000 plants on the whole area. It was found in 1947 that the best qualitative and quantitative results were obtained with plants whose parents had grown in the altitude range 700–1200 m. Results of a comprehensive analysis conducted in spring 1949 are tabulated, the following characteristics being taken into consideration: (1) growth and habit of stems; (2) side branches; (3) number of stems with Lammas shoots; (4) average height of stems in 1949; (5) average stem diameter (at the collar, at ⅔ of last-year's height, at mid-height [?]); (6) average height increment, and (7) drought resistance. Principles of classification (positive and negative points) are described, and the final results given. Of the six best plants, 5 are of Czechoslovak (Sudetenland, Moravia, Slovakia), and one of Polish origin (Silesia). The worst results were obtained with Finnish, Austrian, Swiss, and Italian plants. The 'Tatra Larch' has been equalled by the Moravian (Paršovice) and Sudeten (Hubertskirch).

255. Jüttner, O. Leistung des Tulpenbaumes (*Liriodendron tulipifera* L.) in einem Holzarten-Anbauversuch im Forstamt Wolfenbüttel. [**Yield of *L. tulipifera* in a species trial plot in Wolfenbüttel forest district.**] *Forst u. Holz* 7 (16), 1952 (219–21). [G.]

The data presented show that in height and diameter, *L. tulipifera* surpassed Hickory, Beech and Japanese Larch growing on the same site.

256. Johnsson, H. Ungdomsutvecklingen hos stjälkek, druvek och rödek. [**Early development of Pedunculate, Sessile, and Red Oaks.**] *Svenska SkogsvFören. Tidskr.* 50 (2), 1952 (168–93). 17 refs. [Sw.sw.]

Two series of experiments were carried out in Skåne, at Knutstorp and at Skäralid. At Knutstorp 16,200 Oaks (1 + 0 plants) were planted out in 1940, 200 each of 81 progenies, including 3 of *Q. borealis* and 1 each of *Q. velutina* and *Q. ellipsoidalis*. In 1951 the individual trees were classified by the appearance of the leaves and in some cases of the buds as *R* (*Q. robur* type), *P* (*Q. sessiliflora* type) and *I* (intermediate). The progenies were then divided into 4 groups: (1) those containing only *Q. robur*, *R*-group; (2) those containing mainly *Q. robur* with some intermediate forms, *R* + *I*-group; (3) those with trees of all 3 types, *R* + *P* + *I*-group; and (4) those with *Q. sessiliflora* and some intermediates, *P* + *I*-group. An examination was made for the presence of leaf hairs in the different groups. Results are tabulated. In (1), 3·7% of the trees had hairs on the underside of the leaves. In (2) an average of 7·9% of the *R* and 23·1% of the *I*-type trees had leaf hairs; in (3) 12·4% of the *R*, 81·8% of the *P* and 54·1% of the *I*-type had leaf hairs; and in (4) 90·5% of the *P* and 72·6% of the *I*-type had leaf hairs. Tabulated results of height and d.b.h. measurements are also given. In (1), the average height was 273 cm. and d.b.h. 25·6 mm., and in (2) 249·6 cm. and 22·4 mm. In (3) the figures were 220·1 cm. and 18·9 mm.; the average heights for the different types within their group were: *R*—211·7 cm., *P*—240·9 and *I*—211·1. The comparatively low figure for the *R* trees in this group suggests that they are in fact intermediate forms. In (4) the average height was 223·8 cm. (*P*—259·3 and *I*—203·4 cm.), and the d.b.h. 19·5 mm. A clear correlation could be found in each of the 4 groups between the 1000-seed weight of acorns and height at 12 years, but it is difficult to tell whether the correlation is true or how far it is related to the presence of *P* or *I* in the groups.

The Red Oak species at Knutstorp failed almost entirely; mortality was 52·7% and the development of the remaining plants was unsatisfactory. In the Skäralid experiment, 150 2-year plants of 1 progeny each of *Q. robur* and *Q. ellipsoidalis* and 3 of *Q. borealis* were planted out in 1941. The tabulated results show average heights and diameters (in brackets) of 439 cm. (3·80 cm.) for *Q. robur*, 365 (2·66) for *Q. ellipsoidalis* and 439 (3·11), 527 (4·03) and 533 (4·19) for the 3 progenies of *Q. borealis*. Mortality was higher for the Red Oaks than for *Q. robur*.

The distribution of *Q. robur*, *Q. sessiliflora* and intermediate forms in Sweden is discussed [cf. *For. Abstr.* 9 (No. 2122)]. The need for establishing plant nurseries with pure *Q. robur* and *Q. sessiliflora*, with special emphasis on *Q. robur*, is stressed. Intermediate forms should be avoided. The failure of Red Oak at Knutstorp may have been due to damage by spring frost; no obvious differences exist between the two sites. The rapid early development of *Q. borealis* at Skäralid suggests that it may be valuable in Sweden, and earlier literature on its use in Germany and Denmark is quoted. [Cf. *For. Abstr.* 7 (No. 1700).]

257. Banan, G. A. [**Eucalyptus trees.**] *Journal of the Forestry Institute, Teheran* 2 (5), 1951 (2, 5, 8, 10). [Per.]

Includes some account of the introduction of Eucalypts to Persia. Of 96 species said to have been planted in the Institute at Lahijan, many died of cold when tried out in north Persia. Species recently introduced to the Forestry Institute include the hardy *E. dalrympleana*, *E. gigantea* and *E. sieberiana*, seeds of which have been sent to the forest departments in Gilan and Astara.

258. [**Trials of exotic Pines in S. Rhodesia.**] *Rep. For. Dep. S. Rhod. 1951*, 1952 (12–4).

Trial plots have been laid down to test different methods of artificial regeneration in clear-cut Pine stands. Patch hoeing gave the best results.

particularly where slash had been burnt beforehand Cuttings of Pine were taken some years ago and the following species are established and growing vigorously: *Pinus patula*, *P. pseudostrobus*, *P. leiophylla*, *P. insularis*, *P. caribaea*, and *P. taeda*. *P. radiata*, *P. canariensis* and *P. muricata* are less thrifty. A succession of dry years has been of use in indicating which species can stand up to drought: *P. halepensis* struggles to survive in Matabeleland, and *P. caribaea* died off at Mtao. It was noted that the larger transplants (18–20 in. high) of *P. longifolia* and *P. radiata* stood up to drought better than smaller ones.

259. **The present and potential contribution of the forests.** *Carib. For.* 13 (1), 1952 (6–13, 27–35). [E.Span.] (*Rep. U.S. trop. For. Exp. Sta.* 12, [1951?].)

Presents data on growth in Puerto Rican plantations of *Swietenia macrophylla*, *S. mahagoni*, *Eucalyptus robusta* [cf. *For. Abstr.* 13 (No. 1115)], *Montezuma speciosissima*, *Cedrela mexicana*, *Cordia alliodora* and *Petitia domingensis*, and includes a cubic-foot volume table for White Mangrove (*Laguncularia racemosa*). Growth of Teak has been variable and it seems inadvisable to waste good sites on this species in Puerto Rico. Growth in a plantation of *Zanthoxylum flavum* has also been disappointingly slow. *Calophyllum antillanum* is making fair growth on 3 very adverse sites.

260. ***Casuarina* fails on wet site.** *Carib. For.* 13 (1), 1952 (18, 41). [E.Span.] (*Rep. U.S. trop. For. Exp. Sta.* 12 [1951?].)

Casuarina equisetifolia has proved a very hardy tree for improving exhausted soils in the Rio Abajo Forest (altitude 500 ft., rainfall 80 in. annually). On a wet site, however, a number of trees have died, apparently of a root rot.

261. **Recently introduced species tested.** *Carib. For.* 13 (1), 1952 (18, 41). [E.Span.] (*Rep. U.S. trop. For. Exp. Sta.* 12 [1951?].)

Tabebuia donnell-smithii was introduced into Puerto Rico 4 years ago for testing on a variety of sites. In the Luquillo Forest (altitude 500 ft., rainfall 110 in. annually) on a deep lateritic soil, 4-year-old trees are 30 ft. high and 4–5 in. in diam. In the Cambalache Forest (altitude sea-level, rainfall 60 in. annually) on a shallow limestone soil trees of the same age are 10–12 ft. tall, and 1–2 in. in diam.

262. CHINTE, F. O. **Trial planting of large leaf Mahogany (*Swietenia macrophylla* King).** *Carib. For.* 13 (2), 1952 (75–91). 33 refs. [E.Span.]

Notes on the tree, its silvicultural requirements, and the history and development of plantations up to 36 years of age in the Philippines, with data on height and diameter growth, and volume of the trees. *S. macrophylla* seems promising for reforestation in the Philippines. Seed should be sown at a depth of 3–8 cm. The seedlings require partial shade, and should be planted out when 40–100 cm. in height. The tree thrives best in areas with abundant rainfall distributed throughout the year. Mean annual diameter growth of 21-year-old trees in the Philippines is 1·13–1·86 cm.

232.12. *Races and Provenance Trials*

See also Nos. 82, 254, 256.

263. SCHULZE, H. Om skovtræernes proveniens. [**The provenance of forest trees.**] *Hedeselsk. Tidsskr.* 71 (3), 1950 (102–13). 12 refs. [Dan.] C.G.B.

Summarizes briefly literature, mainly Scandinavian, relevant to the provenance of Oak, Beech, Birch, Alder, Ash, species of Pine, Norway Spruce and Japanese Larch for use in Denmark.

264. SCHANTZ-HANSEN, T., and JENSEN, R. A. **The effect of source of seed on growth of Jack Pine.** *J. For.* 50 (7), 1952 (539–44). 10 refs.

Report on a provenance trial using seed from 32 provenances in the U.S.A. and Canada, at Cloquet, Minn. Jack Pine of northern origin was in general slower growing than that from the southern limit of its range. Most of the trees, regardless of origin, were of bad form and this is regarded as being largely due to insect damage. Differences between provenances in both height and form were striking.

265. CUMMINGS, W. H. **Loblolly Pine shows early differences with source of seed and locality of planting.** *J. For.* 50 (8), 1952 (626–7).

Preliminary results of provenance trials now in progress in the southern states of the U.S.A.

232.13. *Trials of Hybrids and Other Products of Tree Breeding*

See Nos. 81–2, 88, 97, 450.

232.2. Preparatory Work, Auxiliary Measures

See Nos. 238–9, 305, 318, 406, 413, 914.

232.3. Seed, Nursery Practice, Direct Sowing

232.31. *Seed*

See also No. 916.

266. PANOV, A. Prethodni rezultati ispitivanja sjemena jele sa područja NRBiH. [**Preliminary results of research on Fir seed from Bosnia and Herzegovina.**] *Godišnj. Inst. nauč. šumar. Istraž., Sarajevo* No. 1, 1951 (188–99). [Croat.e.russ.]

The author's researches indicate that figures drawn from foreign sources give too low an extraction rate for seeds of *Abies alba*, which in Bosnia reaches 12% (field conditions). There are also other discrepancies, e.g. in number of seeds per kg., and the periodicity of seed years. These suggest that the Balkan form is a separate race. Material relating to Fir seed from Bosnia will be collected and prepared as soon as possible; data so far available are presented in graphs and tables. The apparatus used in extraction should be improved in an attempt to increase production. *From author's summary.*

232.311. Seed Production (Seed Years, Seed Crops etc.).

See also Nos. 81–2, 266.

267. **A guide for the selection of superior trees in the northern Rocky Mountains.** *Misc. Publ. Nth. Rocky Mt. For. Range Exp. Sta.* No. 6, 1952. pp. 7.

A report by the Forest Genetics Steering Committee containing guides for selecting superior trees, in general, and of individual species (White Pine, Ponderosa Pine, Western Larch, Douglas Fir, Engelmann Spruce, Lodgepole Pine, Grand Fir, and Douglas-Fir Christmas trees), and a proposed system for recording them.

232.312. Seed Collection, Extraction and Grading

See also Nos. 170, 266, 423.

268. Ahola, V. K. Lehtikuuset valtion metsissä. **[Larch stands in the State forests.]** *Metsät. Aikak.* 1952 (3/4), (89–91). [Fi.e.]

Results on 320 ha. of Larch stands indicate that in Finland Larch and Pine need equally good site conditions, and that Larch is more susceptible to snow damage than Pine and Spruce, and needs protection against cattle-grazing and elk damage. Investigations at the ranger schools have shown that cones collected in late March or early April can have the seed extracted without crushing the scales and do not become resinous during extraction. The Forest Service has arranged that the best stands should be used for seed collection and grafting.

269. Chai, T. S., and Hansen, H. L. **Characteristics of Black Spruce [*Picea mariana*] seed from cones of different ages.** *Minn. For. Notes* No. 2, 1952. pp. 2.

Seeds from cones that have been on the tree for many years are significantly lighter in weight than seeds from cones that have been on the tree for only a few years. The % of seeds that germinate decreases gradually with increasing age of cones; germination from 6-year-old cones, however, was still more than half as good as that from 1-year-old cones. The average number of seeds/cone decreases with age, since Black Spruce cones release their seed intermittently over a period of many years. Six-year-old cones had about $\frac{1}{4}$ as many seeds as 1-year-old cones. A few seeds were found even in 19-year-old cones—the oldest examined.

232.314. Seed Purchase, Trade and Transport.

270. **Exchange of forest seeds and plants.** *Report of the 6th Session of the Conference of FAO, 19 November–6 December 1951*, 1952 (82–3, 171–5). [E.F.Span.]

The Conference, having considered the certificates of quality and origin of forest seeds recommended by the European Commission on Forestry after consultation with I.U.F.R.O., and a consignment form intended to expedite the exchange of seeds and plants for scientific purposes, recommended that in order to establish authenticity, member governments take steps to adopt the certificates (forms reproduced in an appendix) and that they should also secure recognition by the appropriate national agencies, of the standard consignment form (reproduced in appendix).

232.315. Seed Storage and Treatment

See also No. 423.

271. Ahola, V. K. Männyn ja kuusen siemenen itävyyden säilyminen. **[The duration of germinability in Pine and Spruce seed.]** *Metsät. Aikak.* 1951 (2/3), (47–8). [Fi.e.]

Tests by the State Seed Testing Station of Pine and Spruce seed stored in various forest district stations showed that: (1) Seed having a germination of 85–95% when fresh can under sealed storage retain a satisfactory level of viability for 10–15 years, e.g. Pine seed extracted in 1935–8 gave 74% in 28 days in 1947, Spruce extracted in 1940 gave 47% in 21 days in 1950. (The initial germinability of these batches is unfortunately not accurately known.) Further, ca. 400 kg. of Spruce seed sold by the Forest Service to the Central Forest Association nurseries in 1950 gave 74–90% germination after 8–10 years' storage. (2) Resin-sealed bottles are better than cans. (3) Seeds with an initial germination below 80% and any seed, however good, not in air-tight storage, should be used within 2–3 years.

272. Nyholm, I. Bøgeoldens spiringsforhold. **[Germination of Beech mast.]** *Dansk Skovforen. Tidsskr.* 36 (12), 1951 (634–44). 8 refs. [Dan.dan.]

Literature on methods of storing Beech mast before sowing is discussed. During the winter 1950–51, germination tests were made with seed from Germany, Holland and Switzerland (1) on embryos removed from the shell and kept on damp filter paper at 16–22° C. (test completed in 14 days); and (2) by storing intact seed in damp sand at 1–10° and counting germinated seed monthly (test completed in 3–5 months). Results, with a rough assessment of germination in the seedbed after sowing in spring 1951, are tabulated. Method (2) gave over 80% germination for all seed lots. Method (1) gave germination percentages of 54 and 72 for the two German lots, which also showed good seedbed germination (roughly 45 and 30%), but only 18 and 14 respectively for the Dutch and Swiss lots, which were probably too dry when received and which gave poor seedbed germination (0–5%). Reports from several nurseries showed that seed from identical lots germinated differently according to winter storage, better germination always being obtained for storage methods that maintained the moisture content of the seed. Laboratory tests on seed recovered from nurseries where it had been sown but had failed to germinate showed that some of it would germinate after storage in moist peat litter at 5°, the germination % (tested at 20°) increasing with increasing period of storage up to 12 weeks, the limit of the test. Other recovered seed was kept in moist peat litter at 1° or at 5° for up to 6 weeks (samples being removed every 14 days for germination tests at 20°) or maintained at constant temperatures of 10, 15 and 20°. Results are tabulated. The most noticeable fact is the good germination, 70% after 16 weeks, obtained from seed maintained at 10° constant.

It is concluded that in view of the need for afterripening, which takes place automatically at the right moisture content (30–36%) and temperature (ca. 5°), efforts should be made to secure these conditions. Seed should be subjected to a germination test on receipt, either after a few weeks' stratification at 4° or else by the more rapid excised-embryo

method. If the result is good, the seed may be given ordinary storage conditions (stored in a layer 10–20 cm. thick and covered over): if poor, it may be autumn sown (though frost, mouse damage or a heavy soil will make this undesirable) or stratified at ca. 5° for a few months before sowing in spring. In the latter case, stratification should not occur too early, as the seed will germinate well at this temperature.

273. RUDOLF, P. O. **Cold-soaking of Jack Pine seeds.** *J. For.* 50 (8), 1952 (626). 4 refs. [Lake States Forest Experiment Station.]

Soaking for 8 days in water at 41° F. was about as effective as 30 days' stratification in improving germination.

274. DAVID, R., and GUÉRINDON, A. Influence stimulante exercée par le froid sur la germination des graines de pin maritime. [**Stimulating effect of cold on the germination of seeds of *Pinus pinaster*.**] *Comptes Rendus des Séances de la Société de Biologie et de ses Filiales, Paris* 145 (9/10), 1951 (715–7). 2 refs. [F.] O.R.S.

Seeds were soaked for 10 days at 16° C., during which time they absorbed about 25% of their dry weight of water, and kept stored at 2° for periods of 13 days to 10 months. Results, given in a table and a graph, show that: (1) the germination % increases with length of treatment up to 200 days, when it reaches 92%; (2) germinative energy is increased by treatments of 3 months or over, seed so treated giving a germination of 52% after 10 days, whereas untreated seeds take 30–60 days to reach the same %. The same % was obtained in 5, 3, 2 and 1 days after treatment for 138, 170, 192 and 206 days respectively; (3) the germination of untreated seeds varies with the season. [Cf. *For. Abstr.* 12 (No. 2889).]

275. DAVID, R., and GUÉRINDON, A. L'influence de la dessiccation des semences 'activées' de pin maritime sur leur germination. [**The effect of drying 'stimulated' seeds of *Pinus pinaster* on their germination.**] *C.R. Acad. Agric., France* 39 (7), 1952 (278–80). 1 ref. [F.f.] A.P.B.

Seeds which had been stimulated by storage at + 2° C. [cf. *For. Abstr.* 12 (No. 2889)] were dried out from a moisture content of 25% of the fresh weight to (1) 10%, by exposure over $CaCl_2$ at 16° for 42 hr.; (2) 9·75%, by heat treatment at 25° for 5 weeks; (3) 15%, by treatment with infra-red rays for 17 hr.; and (4) 9%, by a combination of (2) and (3) for 8 hr. None of these drying treatments reduced the germination % of the stimulated seeds.

276. PODOLJSKAJA, O. I. Povyšenie gruntovoï vshožesti semjan i uskorenie rosta sejantsev. [[**Seed treatments for] increasing field germination of seed and rate of growth of [the resulting] seedlings.**] *Dokl. Akad. Nauk SSSR* 67 (3), 1949 (573–5). 2 refs. [Russ.] A.P.B.

Describes experiments with various chemical soaking treatments and recommends: (1) for *Thuja orientalis*—succinic acid (3 g./litre; 12 hr. soak), $MgCl_2$ (30 g./litre; 12–24 hr.) or $KMnO_4$ (0·01 g./litre; 12 hr.); and (2) for *Juglans regia*—$MgCl_2$ (30 g./litre; 12 hr.), KNO_3 (10g./litre; 12–24 hr.) or $KMnO_4$ (0·01 g./litre; 12 hr.).

277. CHINTE, F. O. **Pretreatment of leguminous seeds to hasten germination.** *Filipino For.* 3, 1951 (29–44).

A number of treatments (hot and cold water soaking for various periods, mulching seedbeds, and mixing seed with wet wood ash) were tested on 9 species. The results are given in detail. None of the treatments improved germination of *Cassia fistula*, or *Samanea saman*. Soaking in tap water for 15 hr. gave the best results with *Acacia catechu* and *Bauhinia purpurea*, and for 30 hr. with *B. monandra* and *C. bacillaris*. Seed of *Intsia bijuga* should either be covered with a 2-in. mulch after sowing, or mixed with wet wood ash for 30 hours and then washed in tap water before sowing. Best results were obtained with *Peltophorum inerme* by soaking in water with an initial temperature of 80° C. and allowed to cool for 15 hr. *Sindora supa* seed gave best results when mixed with wet wood ash for 15 or 30 hr. and then washed in tap water before sowing.

No correlation was observed between increase in weight or volume of seeds after treatment and germination %.

278. CAVAZZA, L. L'azione dell' alcool sui semi duri. [**The action of alcohol on hard seeds.**] *Nuovo G. bot. ital. (n.s.)* 58 (2), 1951 (393–7). 4 refs. [It.it.e.] A.P.B.

Alcohol reduced the efficacy of hot-water treatment on seed of *Gleditsia triacanthos*, but the use of alcohol in conjunction with cold-water soaking helped to split the seed coat.

232.32. *Plant Rearing. Nursery Practice*

See also Nos. 249, 262, 310.

279. MÉTRO, A. E. Les pépinières forestières au Maroc. [**Forest nurseries in Morocco.**] *Broch. tech. Sta. Rech. Exp. for., Rabat* No. 1, 1951. pp. 68 + 3 plates. [F.]

Describes current nursery practice in general, with particular notes on a number of species.

280. WELLS, T., and MCWILLIAMS, H. G. **Nursery practice at the Green Timbers forest nursery [, British Columbia].** *Tech. Publ. B.C. For. Serv.* No. *T.*24, 2nd ed., 1952. pp. 7.

The first edition of this publication was issued in 1940. [Cf. *For. Abstr.* 2 (p. 39).]

281. ADAMS, A. J. S. **The forest nursery for *Pinus radiata* at Mt. Burr in the south-east of South Australia.** *Aust. For.* 15 (1), 1951 [1952] (47–56). 7 refs.

232.322. Preparation and Treatment of Soil, including Maintenance of Fertility

See also Nos. 16, 310, 747.

282. JACOBI, E. F. Proefveldjes met verschillende pH op zandgrond. [**Sample plots with varying pH on sandy soil.**] *Jaarb. Ver. Proeft. Boskoop* 1951 (23–5). [Du.]

Nursery experiments over 4 years show that *Acer platanoides* plants do best at pH 6–6·65, *A. pseudoplatanus* at 6·8–7·15, *Betula pendula* and *B. pubescens* at 5·1–6·65, *Fraxinus excelsior* at 5·0–6·65, *Quercus*

borealis maxima at 5·85–7·15 and *Q. robur* at 5·5–6·65.

283. **Nutrition problems in forest nurseries.** *Rep. Rothamst. exp. Sta. 1950*, 1951 (40–1).

Sitka Spruce seedlings showed large responses to each of the major nutrients in experiments on very acid soils, but in some of these experiments composts well supplied with N, P, and K gave better results than inorganic fertilizers. It appeared that fertilizer N applied in the seedbeds in spring and in an early summer top-dressing had been leached out of the surface soil during the very wet summer and autumn before the period of most active growth.

In the neutral or slightly acid soils of old nurseries, Sitka Spruce seedlings generally make very poor growth, even when well manured with compost or fertilizers. In 1950 at several nurseries there were striking responses on such soils to acidification in previous years by $(NH_4)_2SO_4$ or S. Repeated dressings of $(NH_4)_2SO_4$ appear to provide a safe method of supplying available N and at the same time acidifying the soil. If this kind of result can be repeated under other conditions, it may offer a simple, practical remedy for an acute example of 'soil sickness'.

The hypotheses that the beneficial effects of soil sterilization are due to the elimination of soil fungi harmful to or competing with the roots of conifer seedlings, was tested in several nurseries and in a series of pot experiments. Many fungicides and two antibiotics were added to the soil or applied as seed dressings. Several of these materials reduced early deaths by damping off in the pot experiments, and others damaged the seedlings. None of them, however, approached steam or formalin in their general effects on growth. These results indicate that the control of soil fungi may be a relatively unimportant factor in the effects of steam, formalin and acidification in improving the growth of Sitka Spruce seedlings on 'Sitka-sick' soils.

An indication of the complexity of formalin effects was given in two experiments on very acid nurseries, one on heathland and the other in a clearing in a conifer forest. On plots without formalin, inorganic fertilizers gave better plants than compost. Previous treatment with formalin greatly improved growth on the compost plots but had no effect on the fertilizer plots. The appearance of the plants suggested that those with formalin + compost received large quantities of available nitrogen late in the season. Presumably the formalin retarded the breakdown of proteins from the compost.

232.323. Sowing and Covering

284. Tomaševski, S. Jesenska sjetva alepskog bora, crnog bora i čempresa u rasadniku. [**Autumn sowing of *Pinus halepensis, P. nigra* and *Cupressus sempervirens* in the nursery.**] *Šum. List* 76 (5/6), 1952 (164–7). [Croat.]

An experimental sowing of *P. halepensis* was made in autumn 1950; the seed germinated after 15–20 days, and when the growth period ended early in January, the seedlings were 2–3 cm. high. In March 1951, an ordinary spring sowing was made. The autumn plants were watered only once after sowing; the spring plants, 3 times. Stem and root lengths of the autumn and spring seedlings (ca. 700 of each) were measured in October, 1951. The average length of the stem and root was only slightly greater for autumn than for the spring seedlings. For a given stem height, the autumn had longer roots than the spring seedlings when the stem height was under 7 cm., and shorter roots when it was over 7 cm. Owing to preliminary soil cultivation, the spring seedlings had long and tender main roots, with practically no side roots; whereas in autumn seedlings, the main root and side roots were strong and thick. Autumn sowing was found to strengthen the seedlings against *Fusarium* attack. Though this, and the easier tending (less watering), are in favour of autumn sowing, the plants may become too strongly grown for transplanting. On the other hand, it is believed that autumn sowing would be advantageous for *P. nigra* and *Cupressus sempervirens* (no trials were made with these), which have small seedlings that might need to remain in the nursery for only 1½ years instead of 2 years as heretofore.

232.325. Tending (in both Seedbeds and Transplant Beds)

285. Šimák, M. Om bevattning av tallsådd med saltvatten. [**Watering Pine sowings with sea water.**] *Medd. SkogsforsknInst., Stockh.* 41 (4), 1952. pp. 14. 9 refs. [Sw.e.] Price *Kr.*1.

Of 25 plots, 25 × 40 cm., each sown with 200 seeds, 5 each were watered with: (1) and (2) salt water from two different places and with different concentrations of chlorides, (3) and (4) mixtures of (1) and (2) with equal amounts of fresh water, and (5) fresh water. Germination decreased and % of damaged plants increased with the content of chlorides in the water. Neither germination nor survival was appreciably lowered on plots watered regularly with the two mixtures of salt and fresh water (chloride concentration up to 0·07%) for 30 days but after they had been allowed to dry out for the next 22 days mortality was much higher on these plots than on those which had been watered with fresh water. It is concluded that salt water from the Baltic sea, even when diluted with fresh water, cannot be used in nurseries. Results are tabulated.

286. Tazaki, T. **The fate of seedlings of *Pinus thunbergii* in relation to the chlorine content of the soil.** *Bot. Mag., Tokyo* 63 (739/740), 1950 (12–7). 4 refs. [E.] I.M.I.

In laboratory experiments, seeds were sown and seedlings grown in containers, in sand moistened with different strengths of NaCl solution or of diluted sea water. The number of seeds to germinate decreased, and germination was retarded, when the Cl exceeded 20 mg./100 g. dry sand (0·20–0·50% of the sand moisture) and germination almost ceased when it exceeded 60 mg. (0·55–1·50%). In tests on seedlings, survival about 1 month after germination was similar to that of controls at Cl concentrations below 0·3% of the sand moisture and was considerably reduced for concentrations above 0·3%, while no seedlings survived at concentrations above 1%. Survival was a little higher when the sand

had been moistened with sea water. Salt concentrations in sand dunes are generally low enough to allow seedling growth.

287. FAULKNER, R. **Notes on nursery irrigation and on chemical weed control practices in the U.S.A. and Canada.** *Forestry* 25 (2), 1952 (126–34). 6 refs.

The main purposes of irrigation in American and Canadian nurseries are explained. Information is given on the quantity and quality of water used, the types of pump required for specific operations, and the types of pipe used in the lay-out of underground supply channels. Three types of irrigation system are fully discussed, along with the main advantages and disadvantages. The systems described are the flood, the overhead lateral line, and the rotary-head sprinkler system. The use of mineral spirits as selective weedkillers in conifer nurseries in America is outlined, with data on products used, their effectiveness, quantities and times of application, and costs. *From author's summary.*

288. MAKI, T. E., and ALLEN, R. M. **Use of allyl alcohol for weed control in forest nurseries.** *J. For.* 50 (6), 1952 (470–1). [Sth. For. Exp. Sta., New Orleans, La.]

Allyl alcohol ($CH_2 : CHCH_2OH$) has been used successfully at one small Mississippi nursery over a period of 4 years (1948–51). It greatly reduced weed populations, cut man-hours of weeding by three-quarters, and did not impair field performance of seedlings. The chief drawbacks are that it takes time to apply and requires a lapse of at least 3 days between treatment and sowing. Rather elaborate precautions are essential for safe application.

289. ALLEN, R. M. **Ferbam controls nursery weeds.** *Sth. For. Notes Sth. For. Exp. Sta.* No. 80, 1952 (3).

In a small test in a South Mississippi forest nursery Ferbam and allyl alcohol alone or combined were applied in water as soil drenches at total rates of 10,890 gal./acre (50 gal. allyl alcohol and 500 lb. Ferbam/acre). Application was in April, 3 days before Longleaf Pine was sown. The nursery plots were weeded 67 days after sowing. Green weights of weeds removed per sq. ft. of nursery bed were: untreated plots 60·25 g.; plots treated with allyl alcohol 2·88 g.; plots treated with Ferbam, 0·25 g.; and plots treated with both combined, 0·12 g. Neither chemical reduced the density of the seedling stand.

290. LARSON, P. R., LOERCH, K. A., and HANSEN, H. L. **The tolerance of several tree species to TCA [Na trichloroacetate] used in controlling quack grass (*Agropyron repens* (L) Beauv.) in nurseries.** *Minn. For. Notes* No. 6, 1952. pp. 2.

Autumn applications had no ill effects on the germination and survival of autumn-sown *Pinus resinosa* and *Fraxinus pennsylvanica* var. *lanceolata*. Seedlings of *Ulmus americana* and *Picea glauca* transplanted in the spring to beds treated with TCA in the preceding autumn survived as well as those in untreated beds. Post-emergence spraying of seedbeds killed all 6-week-old *P. banksiana* seedlings.

291. **Pre-sowing herbicides effective in nursery.** *Carib. For.* 13 (1), 1952 (13, 35). [E.Span.] (*Rep. U.S. trop. For. Exp. Sta.* 12, [1951?].)

A mixture of TCA at the rate of 50 lb./acre and 2,4-D at 8 lb./acre is recommended for treating seedbeds before sowing *Casuarina equisetifolia* or *Swietenia mahagoni*. This prevents heavy weed growth for 2 months.

292. MAHLSTEDE, J. P. **Further developments in weed control in established nursery stock.** *Res. Rep. 8th ann. Nth. Cent. Weed Control Conf.* 1951 (110).

The following species were tolerant to spring and summer applications of Crag Herbicide 1 (sodium 2,4-dichlorophenyl-ethylenedioxysulphate) at a rate of 4 and 6 lb./acre, and to Stoddard solvent at 75 gal./acre: *Juniperus virginiana, J. procumbens* (3rd and 4th year), *Syringa* sp. and *Philadelphus* sp. (2nd year).

293. MAHLSTEDE, J. P. **The control of weeds in conifer transplant beds.** *Res. Rep. 8th ann. Nth. Cent. Weed Control Conf.* 1951 (111).

Applications of Crag Herbicide 1 (see preceding abstract) in June and July to 3-year-old seedlings of *Thuja orientalis*, gave good control of the principal weeds without damage to the seedlings. Applications of EH_2 (dichloral urea) at the same rate, produced severe bronzing and only 25% control of weeds.

294. BROOKS, R. O. **Chemical weeding report for 1951.** *Pa. For. Wat.* 4 (3), 1952 (60–1).

[Cf. *For. Abstr.* 13 (No. 259).] Good results were obtained by tractor-spraying first-year Pine seedlings with Sovasol No. 5 at rates of 37·5 gal./acre and 75 gal./acre. The beds were sprayed once on 21 June and again on 7 July. The saving in cost, compared with hand weeding, is considerable.

232.327. Protection Measures in Nurseries

See Nos. 395, 424–6, 504, 512–5.

232.328. Vegetative Propagation

See also Nos. 81–2, 96, 310, 449.

295. HASEGAWA, K. **Propagation of *Metasequoia glyptostroboides* Hu et Cheng by cuttings.** *Bot. Mag., Tokyo* 64 (757/758), 1951 (163–4). [Jap.e.] I.M.I.

Cuttings 5–10 cm. long were taken from lateral shoots of 1-year-old plants and inserted in a bed out of doors. The % of rooted plants was higher from cuttings planted in July and August than in September, root formation was greatest in cuttings planted in August, and callus formation most rapid in those planted in September. Of the two propagation media used, sand gave the more rooted cuttings. *From author's summary.*

296. HEITMÜLLER, H.-H. Untersuchungen über die Wirkung synthetischer Wuchsstoffe auf die Stecklingsbewurzelung bei Waldbäumen. **[The effectiveness of synthetic growth substances on the rooting of cuttings from forest trees.]** *Z. Forstgenet.* 1 (4), 1952 (100–7). 18 refs. [G.g.]

A considerable number of substances were tried out on *Pseudotsuga taxifolia* and species of *Picea, Larix, Abies, Pinus, Fagus, Acer* and *Ulmus*. Good results were obtained with cuttings under glass. Variations in the effectiveness of the different substances were noted in the different species. Medium

concentrations and medium to short periods of treatment were most effective. Optimum rooting seasons varied with the different species. Temperature differences had no effect on cuttings of conifers or lignified cuttings of hardwoods, but definitely affected unlignified cuttings of hardwoods, 20° C. giving the best results. Direct sunlight hindered rooting, but there was no difference between cuttings rooted in darkness and in indirect sunlight. The presence of terminal or other buds is essential for rooting. One-year-old cuttings rooted more easily than 2- or 3-year-old, and cuttings from young trees more easily than those from older ones. *Picea abies* cuttings from a height of 30 m. rooted better than those from a height of 40 m. Longer cuttings (up to 20 cm.) rooted better than shorter ones (up to 10 cm.). In *Acer* spp., *Picea* spp., and *Pseudotsuga taxifolia*, apical cuttings (i.e. with terminal buds) rooted better than basal cuttings. In *Pinus sylvestris* and *Abies* spp., only the apical cuttings rooted.

297. Boer, S. de. Proeven med groeistoffen, grondmengsels enz. bij het stekken. **[Tests with growth substances, soil mixtures etc. for rooting cuttings.]** *Jaarb. Ver. Proeft. Boskoop* 1951 (27–59). [Du.du.]

[Cf. *For. Abstr.* 13 (No. 1155).] Experiments were made on plants from 39 genera, including *Acer palmatum atropurpureum*, *Ilex opaca*, *Juniperus virginiana glauca*, *Picea abies nidiformis*, *P. abies repens* and *P. omorika nana*, *Populus canescens*, *Quercus robur* and *Q. sessiliflora*, *Taxus cuspidata nana*, *Thuja occidentalis pyramidalis compacta*, and *Ulmus carpinifolia* No. 62 'Bea Schwarz'. Results are tabulated.

298. Vieitez, E. Ensayos de reproducción vegetativa de híbridos de castaño (*Castanea sativa* × *C. crenata*). **[Experiments in the vegetative propagation of *C. sativa* × *C. crenata* hybrids.]** *An. Edafol. Fisiol. veg.* 11 (2), 1952 (185–209). 23 refs. [Span.span.e.] E.M.B.

Reports on various attempts to root cuttings of this disease-resistant hybrid, using β-indolylacetic acid, α-naphthaleneacetic acid and other substances. None of these induced rooting. The most promising results were obtained with cuttings in leaf taken from a tree in the early stages of fruit development, sprayed daily with a modified Knop's solution, and treated with a proprietary dust. These cuttings lived longer than those in the remaining experiments, but formed no roots.

299. Dragone-Testi, G. Azione del solfato di rame sul radicamento di talee di *Salix alba* L. **[The effect of copper sulphate on the rooting of *Salix alba* cuttings.]** *Nuovo G. bot. ital.* (*n.s.*) 58 (2), 1951 (420–1). [It.it.] A.P.B.

Rooting was promoted by immersing the cuttings in dilute (*N*/100–*N*/1000) solutions of $CuSO_4$ for periods ranging from 15 minutes to 24 hours, washing well, and then standing in plain spring water changed daily.

300. Leibundgut, H., and Grünig, P. Vermehrungsversuche mit Weidenarten aus schweizerischen Flyschgebieten. **[Studies in the [vegetative] propagation of Willows on Swiss flysch areas.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 27, 1951 (469–89). 4 refs. [G.g.f.]

[Cf. *For. Abstr.* 12 (No. 2721).] Tests with a number of species and varieties showed that there was no difficulty in large-scale vegetative propagation.

301. Vreeling, L. H., Vogel, P. de, and Ravensberg, K. Proeven met kunstmatige belichting bij het stekken en zetten. **[Experiments with artificial lighting in propagating by cuttings and in grafting.]** *Jaarb. Ver. Proeft. Boskoop* 1951 (72–4). [Du.]

Experiments were made from 22 November to 28 December, 1951 on the effect on Birch grafts of daily exposure from 6 p.m. to 2 a.m. to artificial light from lamps of 8 strengths, ranging from 25 to 200 watts. For each lighting strength, 180 scions of *Betula verrucosa youngii*, half grafted on *B. pubescens* and half on *B. verrucosa* (both 2-year-old stocks), were used. The following results were found at an inspection on 23 January 1952: (1) growth of the union was increased by strong lighting, *B. pubescens* reacting more strongly and forming more callus; (2) shooting of both stock (especially of *B. pendula*) and scion was increased by strong artificial light; and (3) artificial light appeared to have no effect on the % of successful grafts. The best results were obtained using 244 watts/sq. m., which stimulated the growth of the union without much increasing shooting of the scion. Artificial light did not appear to increase shooting in cuttings of *Picea pungens glauca*.

302. Stefansson, E. Ympning av barrträd på friland. **[Grafting conifers in the open.]** *Svenska SkogsvFören. Tidskr.* 50 (2), 1952 (194–220). 16 refs. [Sw.]

Scions for summer grafting collected between January and April were found to keep best when packed in ice or moss and kept at temperatures between − 5 and − 15° C. The highest number of successful grafts was obtained from scions consisting entirely of 1-year-old wood. To determine the best time for grafting, grafts were made at different periods in 1950 and 1951. No results are available for Pine grafts made between 1 August and 2 October 1950 because of heavy damage during the winter by *Phacidium infestans*. An inspection in July 1951 showed that the number of successful Spruce grafts decreased from 54% for those made on 1 August to 8% for those made on 1 September, increasing again to 28% for those made on 2 October. The scions were taken from 10 trees and the number of successful grafts for the individual parent trees ranged from 6 to 51%. Results from Spruce grafts made in May and June 1951 were very good; in September there were 76, 90, 100 and 100% successful grafts of those made on 22 May, and 1, 11 and 20 June respectively. The corresponding figures for Pine were 86, 96, 98 and 94%. An October check showed that 97% of Spruce grafts made on 18–20 July were successful. Methods of grafting, the preparation of grafting stock and the need for shading grafts from the sun are discussed. Results of experiments on grafting Pine, Spruce and Larch in the open from 1949 to 1951 are briefly

reviewed. Of 4212 grafts, 3370 (80%) were successful. For Larch 94% of the 1097 grafts were successful. [Cf. *For. Abstr.* 13 (No. 3794).]

303. Veredeling van bosbomen. [**Grafting forest trees.**] *Korte Meded. Bosbouwproefsta. T.N.O., Wageningen* No. 12, 1952 (19–20). [Du.]

Grafts of Scots Pine under double glass between 9 September and 12 October 1950 on to Mountain and Corsican Pine were 66 and 75% successful respectively. Grafting under double glass in late January and early February was 100% successful on all stocks used. Grafts in the open between 9 September and 12 October failed completely and in April gave 25% success.

304. Vogel, P. de. Proeven over het enten van blauwe sparren. [**Experiments in grafting *Picea pungens glauca*.**] *Jaarb. Ver. Proeft. Boskoop* 1951 (63–4). [Du.du.]

When grafts were made in summer (28 July–8 September) in a cold frame: (1) the % of successful grafts increased with later dates of grafting although callus formation was less strong after the end of August; (2) scions from transplants gave better results than those from untransplanted stock; and (3) results were better when stocks were cut back in November of the previous year than when they were cut back a few days before grafting. Grafts made in September in an electrically heated frame showed stronger callus formation than those in a cold frame. Grafting in February and March in a warm greenhouse gave good unions.

232.329. Miscellaneous (including Greenhouses, Frames, Raising in Pots, Tubes etc.)

See Nos. 306–7.

232.33. *Formation of Stands by Direct Sowing*

See Nos. 239–40, 318, 456–7, 914.

232.4. Formation of Stands by Planting

See also No. 249.

305. Hviid, A. Kompedal plantage. [**The Kompedal plantations.**] *Dansk Skovforen. Tidsskr.* 36 (11), 1951 (549–79). [Dan.]

An account of replanting on the area damaged by fire in 1947, with information on the types of plough used in preparing the ground, the relative costs of machine- and hand-planting, and choice and arrangement of species.

232.41. *Planting Stock (Type, Handling and Treatment)*

306. Allard and Perrot. Reboisement industriel au Maroc. [**Industrial plantations in Morocco.**] *Rev. for. franç.* 1952 (6), (399–407 + 3 photos). [F.]

Describes the methods employed for establishing plantations of *Eucalyptus rostrata* and *E. gomphocephala* for pulpwood. Ploughing and disking are necessary to remove all vegetation, 6-month-old pot plants are used, and one or two cultivations are carried out in the first planting season.

307. Setten, G. G. K. ***Eucalyptus robusta* Sm. planting trials.** *Malay. Forester* 15 (2), 1952 (95–6).

Re-examination 2 years after planting, of an experiment with different kinds of planting stock [cf. *For. Abstr.* 13 (No. 281)] of *E. robusta* showed that both survival and height growth were significantly better for (*a*) 12- to 15-in. seedlings raised in bamboo tubes and root-pruned before planting; followed by (*b*) 7- to 9-in. seedlings taken from seedboxes with a cube of earth adhering to the roots, and (*c*) 6- to 9-in. seedlings raised in bamboo tubes and planted intact. All these can be expected to give 90% survival or over and an average height of 18 ft. at 2 years from planting.

308. Stone, E. L. Jr., and Musgrave, R. B. **A method of transplanting small shallow-rooted trees.** *J. For.* 50 (7), 1952 (557).

Norway Spruce 15 years old and 10 ft. high, spaced 2–4 ft. apart in rows 6 ft. apart, were to be lifted for shelterbelt planting. The major lateral roots were severed with a spade at ca. 18 in. from the trunk, and the trees were then lifted by a tractor-mounted manure loader. As the loader progressed down the row, each tree with 2–3 cu. ft. of soil was lifted and set on a square of burlap on a flat-bed trailer. By using the burlap corners as handles, the trees were later placed in planting holes without further disturbance.

232.42. *Methods of Planting (including Use of Fertilizers etc.)*

309. Afanasijev, D. Agrotehnika u šumarstvu. [**Agricultural techniques in forestry.**] *Godišnj. Inst. nauč. šumar. Istraž., Sarajevo* No. 1, 1951 (147–87). [Croat.e.russ.]

[Cf. *For. Abstr.* 13 (No. 3826).] In 1937 an experimental area for studies on forest improvement was established by a group of Jugoslav foresters near Sarajevo, where the growing season is relatively short. The soil, sterile and of poor physical structure, was carefully cultivated in small plots and manured with various fertilizers, the moisture conditions improved by drainage, and the harmful effect of winds reduced by shelterbelts. An important factor was the introduction of shrubs and low trees, mostly *Maclura*, *Mahonia*, *Elaeagnus*, *Rubus*, and *Ribes*, to nurse up the forest crop. The planting density varied from 4166 to 25,000/ha. The main trees tested were: *Picea*, *Quercus*, *Ulmus*, *Juglans*, *Fraxinus*, *Tilia*, *Castanea*, *Larix*, *Acer*, *Pinus sylvestris*, *Aesculus hippocastanum*, and *Pinus nigra*. The fertilizers used were: horse and sheep manure; Nitrophoskal; $CaCN_2$; Ca-urea; Chilean saltpetre; $CaCO_3$; bone meal; horn meal; K salts; coal dust from the Zenicki mines, and mixtures of trace elements: B, and Mn, with aspirin [?]. Some of the results, presented in tables and a graph, are listed below: in 4 years *Tilia* control plants reached an average height of 0·78 m., compared with 5·86 m. for deep treatment with animal manure + $CaCN_2$; a *Quercus* control was 0·96 m. high, against 6·65 m. for animal manuring; a *Larix* control was 1·12 m. after 5 years, against 5·81 m. for animal manuring. Similar figures for *Ulmus* were 0·47–4·75 m. and

1·13–5·76 m. in two series of experiments; for *Fraxinus*: 0·87–6·83 m.; for *Picea*: 0·48–3·00 m.

310. Afanasijev, D. Ogledi sa ožiljavanjem reznica sekvoje. [**Experiments in rooting *Sequoia* [*gigantea*] cuttings.**] *Godišnj. Inst. nauč. šumar. Istraž., Sarajevo* No. 1, 1951 (211–9). [Croat.e.russ.]

Just before World War II (1937–39?), *S. gigantea* was grown from seed at the forest experimental station near Sarajevo. The seeds were steeped in water at 25° C. for 60 hours, then drained, mixed with dry sand and carefully watered. After sowing, the seeds were covered with dry leaves, and, after germination, kept in half-shade. The best sowing time was May, as low temperatures prolong the germination period and increase the danger from fungi, insects, and birds. The sowing patches should be cultivated to a depth of 30–35 cm. and manured with compost or stable dung, the manure/soil proportion being 1:1. Daily watering is required for both seeds and seedlings. Germination of the seeds used (2 years old) was 3·7%. After 4 months, the seedlings were 6–15 cm. high (average 10 cm.), and overwintered without a single casualty. Next spring the plants were pricked out, and grew to a height of 38–56 cm. (average 47 cm.). They were manured in spring and summer with N-K-P fertilizers, and surface-cultivated after each rain. Late in July, one-half of the plants were transplanted into final sites, both manured and non-manured, at various aspects and altitudes (600–930 m.). About 40 plants were treated with 'mineral auxin-biocatalysts' [probably trace elements], responding only after 62 days. Height growth after a year averaged: controls, 28 cm.; on cultivated site, 56 cm.; cultivated and 'auxin'-treated, 82 cm. One of the 'auxin'-treated plants was 2 m. high at the end of that year [1940?]. Only 65 out of 264 *Sequoia* plants survived the war, the taller ones having been felled. After 10 years, the control trees averaged 1·60 m. high (clayey soil on rock substratum); the trees on cultivated and manured sites, 4·50 m. (d.b.h. 9 cm.), and the 'auxin'-treated, 9·60 m. high (d.b.h. 20 cm.). Trees of similar age elsewhere had dimensions as follows: in California, height 3·80 m., d.b.h. 8 cm., Crimea (U.S.S.R.), height 3·10 m., d.b.h., 7 cm. The 9·6m.-high *Sequoias* began to bear cones in 1951, i.e. in the 11th year [?], the usual fruiting age in California and the Crimea being ca. 40 years. The method adopted in the same experimental area for propagating *Sequoia* (and *Chamaecyparis lawsoniana*) by (root and branch) cuttings is also described in detail, and the role played by trace elements is again stressed.

232.43. *Spacing and Arrangement in Plantations*

311. Georgopulos, A. Beitrag zur Wahl des Pflanzverbandes bei Pappelkulturen. [**The spacing of Poplar plantations.**] *Schweiz. Z. Forstw.* 103 (6/7), 1952 (212–24). 12 refs. [G.f.]

Experience in Greece has shown that close spacing followed by thinnings is best both financially and silviculturally. On good sites a spacing of 2 × 2 m. is recommended, and on inferior sites, particularly on sandy soils, 3 × 4 m.

233. *Afforestation*

See also Nos. 37–8, 306, 326, 880–1.

312. Sørensen, A. M. De tømte brunkulslejers fremtid. [**The future of exhausted brown-coal beds.**] *Hedeselsk. Tidsskr.* 72 (5), 1951 (66–72). [Dan.] L.S.

In experiments on worked-out brown-coal beds belonging to the State, planted *Pinus mugo*, *P. sylvestris* and *P. contorta* gave good results in most places, Japanese Larch proved suitable for sheltered areas and species of Spruce were too susceptible to damage by flying sand, while among hardwoods Alder, Birch, *Salix caprea* and *S. cinerea* gave good results. Sowing with Broom at the same time was very successful. A State grant of Kr.100,000 to last 5 years was made in 1949 for planting privately owned, worked-out beds. Planting of one-tenth of the area is carried out free by the Hedeselskab; strips consisting of 4 rows (mostly Pine) spaced 1·25 m. apart [spacing in rows not given] are planted and plants for the rest of the area can be bought by the landowner with the benefit of the usual 40% State subsidy. The area planted by the Hedeselskab is first sown with Broom.

313. Sørensen, A. M. Brunkulslejernes tilplantning. [**Afforestation of brown-coal beds.**] *Hedeselsk. Tidsskr.* 73 (6), 1952 (59–63). [Dan.] C.G.B.

A further account of the work of afforestation already described.

314. Volpini, C. Il rimboschimento della duna di Feniglia attraverso i risultati del primo piano di assestamento. [**The afforestation of the Feniglia dune: results of the first working plan.**] *Monti e Boschi* 3 (5), 1952 (214–22). 6 refs. [It.f.e.]

Includes data on timber and edible-seed production from the *Pinus pinea* stands planted in 1911 to fix the sand dunes bordering on the lagoon of Orbetello; and makes suggestions for future management.

315. Errico, P. D.' Sul rimboschimento del litorale veneziano e sui frangiventi arborei nei retrostanti comprensori di bonifica. [**Afforestation of the Venetian coast and shelterbelts on the seaward boundaries of land-reclamation areas.**] Camera di Commercio, Industria ed Agricoltura di Venezia. *Repr.* from *Giornale Economico* March, 1950. pp. 29 + map. 8 refs. [It.]

Discusses the difficulties of fixing shifting sands on an unstable coastline, and describes the methods used for afforestation of the coastal dunes in Venezia. Species used include *Tamarix gallica*, *Pinus nigra*, *P. pinaster*, *P. halepensis*, *P. pinea*, *Alnus glutinosa*, *Platanus orientalis*, *Populus nigra* and *Robinia*.

316. Hueck, K. Estudio ecológico y fitosociológico de los medanos de Cafayate (Salta). Posibilidades de su fijación. [**Ecological and phytosociological study of the Cafayate sand dunes (Salta). Possibilities of their fixation.**] *Lilloa* 23, 1950 (63–115 + 8 plates). 11 refs. [Span.e.] A.P.B.

The development of the dunes is studied, along with the water régime, temperature, and vegetation

and its natural succession, with particular reference to root development. Planting of *Sporobolus rigens* is recommended as the first fixation measure, followed by *Atriplex* sp. and *Suaeda* sp. After this, afforestation with *Prosopis nigra* may begin.

317. Les bases écologiques de la régénération de la végétation des zones arides. [**The ecological foundations of the regeneration of vegetation in arid zones.**] *Un. int. Sci. biol.* (*Sér. B*) No. 9, 1951. pp. 149.

A symposium held at Stockholm in July 1950. It includes the following papers in English: Biological problems involved in the agricultural use of arid regions (*P. B. Sears*); On regeneration problems of the vegetation in arid zones (*H. Boyko*); Afforestation problems in arid North America (*R. Daubenmire*); Ecological foundations of natural and artificial regeneration of prairies in the central great plains of the United States (*F. W. Albertson*); The ecological management of semi-arid grass and shrub associations (*R. O. Whyte*); and a summary (*H. Boyko*). The following papers are in French: The soils of the semi-arid regions of Africa and their use (*G. Aubert*); Biology and arid regions (*T. Monod*); Report on the arid and semi-arid regions of North Africa (*L. Emberger*); The ecological bases for the use of arid regions (*C. Killian*).

318. Kačinskiĭ, N. A. Posev duba v mikroponiženija kak sredstvo borjby s zasuhoĭ na svetlokaštanovyh počvah. [**Sowing Oak in micro-depressions as a means of combating drought on light chestnut soils.**] *Počvoved.* 1951 (10), (585–603). 6 refs. [Russ.] A.P.B.

Drought is the chief obstacle to tree planting on these soils: near Stalingrad, where the trials described were made, the annual precipitation is only 318 mm. and even this is poorly distributed, falling in early winter when the growing season is over, and as summer downpours when, on the poorly permeable soils, it is largely lost in surface run-off. Dry winds aggravate the problem in the growing season. Snow tends to be blown off in winter, and the resulting soil freezing to prevent the entry of water from melting snow.

The author's trials were established in early April 1950 on land ploughed to 27–30 cm. depth in late August, 1949. Two sites were selected: (*a*) light clay-loam, and locally sandy, relatively favourable to tree growth; and (*b*) heavier, more alkaline soil (transition to solonets), relatively unfavourable, and with local patches of alkali soil (solonets). The results reported relate to (*b*) only, as the really difficult case.

The technique adopted was to form shallow pits 1 m. square and 10 cm. deep, with gradually sloping banks made of the spoil and designed to act as a rain trap without washing back into the pits. These had to be made in spring, but should collect more moisture if made in the autumn preceding the sowings. Oak was sown in early April by Lysenko's nest method, each pit constituting a nest of 5 seed-spots, each sown with 7 high-quality acorns and given 100 g. of mycorrhizal soil + 12 g. of granulated superphosphate. The depth of sowing was 8 cm. (from soil surface in controls; otherwise from bottom of pit), the pit sowings were either unmulched or mulched with sawdust or stable manure, and the mulches were covered with 1 cm. of soil to prevent blowing, so that mulched seed was actually ca. 11 cm. deep in the soil.

On the solonets, light-chestnut soil was used for the surface dressing to stop crusting and to reduce Na′ toxicity, and gypsum was applied in August at 4 tons/ha. Rows were spaced 5 m. apart and nests at 3 m. in the rows, centre to centre. Maize was grown in corridors between the rows to give shelter, the stubble being left after harvesting to catch snow. Cultivation to destroy weeds and prevent soil crusting was done as necessary (5 times) during the growing season.

Studies made at intervals through the season showed that: the pits had considerably moister soil than controls; mulching improved moisture retention; wind force was reduced and soil temperatures were lower in the pits on hot summer days, and considerable snow was trapped in winter. Examinations of the Oak showed that in all cases the best survival and all-round development occurred in (1) pits mulched with manure, followed by (2) sawdust-mulched pits, (3) unmulched pits, and (4) controls. Emergence of seedlings was earliest in the last and latest in the mulched pits, presumably owing to the greater depth of covering. The solonets showed fairly good results, but consistently poorer than the light-chestnut soil. Examination of root systems confirmed the advantages of pitting and mulching, but also revealed that seedlings in pits on the solonets, owing to the very compact, alkaline B_2–C_1 horizons, had poor, shallow root systems and could not be expected to survive long. The solonets is therefore quite unsuited for tree planting unless radically improved by gypsum treatment and agricultural crops followed by salt-tolerant shrubs—a process taking some 10–12 years. On the light-chestnut soil an enumeration in May 1951 showed the following survivals (plants/ha.): (1) 18,830; (2) 16,412; (3) 11,529; (4) 2588.

319. Kalašnikov, A. F. K harakteristike počvennogo pokrova dubravnogo učastka v Saljskom raĭone Rostovskoĭ oblasti. [**Characteristics of the soil of the area set aside for steppe Oakwoods in Sal'sk district, Rostov Province.**] *Počvoved.* 1951 (7), (409–19). 8 refs. [Russ.] A.P.B.

Notes on the soils (various types of clayey chernozems, clayey dark chestnut soils and associated types, including alkaline soils) and brief notes on the growth and health of four 6- to 9-year-old stands of *Fraxinus pennsylvanica*, *Ulmus parvifolia* and *Robinia pseudoacacia* and shrubby species, with an estimate of the suitability of the different soil types for forest plantations.

320. Ṣāibī, H. [**Dry afforestation in the hills of Abbasabad.**] *Journal of the Forestry Institute, Teheran* 2 (4), 1951 (3, 10–1). [Per.]

An account of small-scale afforestation experiments in the dry uplands north of Teheran. Successful trials with Acacia [*Robinia pseudoacacia*?] and Juniper transplants, which survived the summer of 1944 without watering, in trenches 2 m. wide and

0·25 m. deep, led in subsequent years to a standardized technique using 3-year-old stock in trenches 2 × 0·5 × 0·75 m. These were filled with snow, and a layer of fine earth or leafmould put on the bottom before filling and planting with 3 plants each in late autumn or at the end of winter. Northern aspects gave best survival and Juniper did better than Acacia. These species are looked on essentially as nurses for more valuable species like Elm, Maple or Ash which have also shown promise on these barren lands.

321. **[Afforestation in Abbasabad.]** *Journal of the Forestry Institute, Teheran* 2 (7), 1951 (3). [Per.]

A postscript to the previous article, briefly recording progress in the past 6 years. About 36 ha. of dry, stony hillside have been afforested with some 75,000 healthy trees of Juniper, Acacia, Almond, Ash and Sumac, and a park is to be created.

322. STEPHENS, J. **Afforestation of the North Kheri 'phantas'.** *Indian For.* 78 (5), 1952 (265–6).

Gives a short account of experimental afforestation of these grasslands. Areas above monsoon-flood level were burnt, ploughed, fallowed, disked, and then sown or planted with a variety of species, with good survival and growth.

323. FIASSON, R. Essai de reforestation de la pampa vénézuélienne. **[Afforestation trials on the pampas of Venezuela.]** *Rev. int. Bot. appl Agric. trop.* 32 (353/354), 1952 (155–63). [F.] P.R.

In experiments begun in 1948, *Anacardium occidentale* proved most resistant to the excess of rain from May to October and the drought during the rest of the year, and to damage by parasol ants; it is also recommended for its fruits, timber and the pharmaceutical value of its bark, fruits and leaves. Other trees that gave good results were *Eugenia jambos* and *Spathodea campanulata*. *Bauhinia multinervia* was severely attacked by ants. *Tecoma chrysantha* was killed by the alternating rain and drought. *Casuarina* spp. were very resistant to the climate and grew rapidly but were severely damaged by hares. *Samanea saman* gave good results when protected from excessive rain and watered during the dry season. *Eucalyptus* spp. were not resistant to drought. *Gliricidia sepium*, protected from grazing animals in its earliest stages, gave good results as a hedge plant for plantation crops. The study was carried out near Galabazo by a government-sponsored institute, founded in 1947 for research in the llanos.

234. *Formation of Forest by Natural Succession*

See also No. 191.

324. MERZ, R. W., and PLASS, W. T. **Natural regeneration of old fields in southeastern Ohio.** *Tech. Pap. Cent. St. For. Exp. Sta.* No. 129, 1952. pp. 13.

Discusses figures showing average stocking, age, size, and species of trees on 60 old fields abandoned before 1935, and the effect of field size, and topography and exposure on stocking and species.

235. *Underplanting, Advance Planting etc. Nurses and Formation of Mixtures. Interplanting of Inferior Growth*

See Nos. 238, 312, 320, 326, 346.

236. *Care of Regeneration or Plantations in the Initial Stages of Establishment (including Regeneration Surveys)*

See Nos. 238, 246.

237. *Amelioration of Forest Sites*

See also Nos. 16, 238, 309–10, 361.

325. JENSEN, P. Anvendelse af kunstgødning i skovbruget. **[The use of artificial fertilizers in forestry.]** *Hedeselsk. Tidsskr.* 73 (6), 1952 (63–5). [Dan.] C.G.B.

Norway Spruce (2 + 2 stock) planted from 1949 to 1951 was treated in 1951 with 'Nitrophoska' at the rate of 4 sacks (cost Kr.96)/10 ha. Wages amounted to Kr.100, giving a total cost of about Kr.20/ha. A very much increased rate of leader growth was obtained. A dose of 12–15 g. per plant was given. Application from mid-April to mid-May is recommended.

326. MACDONALD, J. A. B., and MACDONALD, A. **The effect of interplanting with Pine on the emergence of Sitka Spruce from check on heather land.** *Scot. For.* 6 (3), 1952 (77–81).

In 1926, plots of Sitka Spruce, planted in 1922–3 on heather, bracken/heather, and bracken/grass types and then gone into check, were interplanted with *Pinus sylvestris* (4 plots), *P. contorta* (1 plot), and *P. mugo* (1 plot). Spruce was left pure on alternate plots, and on the interplanted plots some groups of Spruce were released by thinning the Pine in 1941, 1944, 1946 and 1949. Measurements were made in 1949 on all plots. The results are discussed and it is concluded that by interplanting with Scots Pine, Sitka Spruce can be made to grow well on the moderate type of heather-clad morainic ground with a little bracken, upon which it would be difficult to grow Spruce pure. On the poorest type it would probably be safer to grow pure Pine. On the best bracken/grass type there is little indication that Sitka Spruce required the admixture of Pine, but it would probably be safer to employ a mixture except on sites definitely free of heather. The success of the group thinnings suggests that it might be well to plant groups of 9–16 Spruce in a matrix of Pine; belts of 2 lines of Spruce alternating with 3 lines of Pine might be simpler to deal with.

238. *Timber Plantation Crops requiring Special Treatment*

See Nos. 147–8, 219, 311.

24. TENDING OF STANDS AND TREES

242. *Thinnings*

See also Nos. 238, 362, 573.

327. WILSON, G. M. **Thinning Jack Pine, Nisbet Forest Reserve, Saskatchewan.** *For. Res. Note For. Br. Can.* No. 99, 1952. pp. 24. 7 refs.

Sample plots thinned to various densities were established in 1927 and remeasured in 1948, showing the following results. Current annual increment per tree in diameter and volume increased with intensity of thinning; mortality in number of trees/acre was reduced on thinned plots and showed strong correlation with intensity of thinning. Volume/acre in total cu. ft. was still higher on lightly thinned plots, but volume in merchantable cu. ft. on these plots is the same as or only slightly more than that on heavily thinned plots. *From author's summary.*

328. ALLISON, J. H. **Growth of unthinned Jack Pine stands at Cloquet.** *Minn. For. Notes* No. 1, 1952. pp. 2.

For pulpwood production, unthinned stands of Jack Pine should be cut at 50–60 years. For sawlogs they should be thinned at ca. 40 years, the operation to be repeated as often as the volume to be obtained justifies the cost.

329. SCHANTZ-HANSEN, T. **The Cloquet Red Pine thinning plots.** *J. For.* 50 (6), 1952 (480–2). 8 refs.

Summarizes results so far obtained in this 20-year-old project. [Cf. *For. Abstr.* 7 (No. 1189).]

330. MANN, W. F. **Response of Loblolly Pine to thinning.** *J. For.* 50 (6), 1952 (443–6).

Study of 5 thinning plots in Louisiana indicates that for a pulpwood rotation up to about 35 years, unthinned Loblolly Pine stands have the best cordwood growth. Where early returns are needed, light thinnings, made mainly by removing suppressed trees, are indicated. Landowners desiring maximum production of pulpwood and sawlogs per acre will favour light thinnings to keep the stand just open enough to prevent mortality from suppression. Rotations can be shortened by making heavy thinnings to promote rapid diameter growth, but this will result in lower total cu.-ft. yields.

331. WARRACK, G. **Comparative observations of the changes in classes in a thinned and natural stand of immature Douglas Fir.** *For. Chron.* 28 (2), 1952 (46–56). 3 refs.

Analysis of data obtained from thinning plots established in 1931 in even-aged, fully stocked, natural stands of Douglas Fir at the Cowichan Lake Experiment Station, and from an unthinned control plot, gave the following results: At the end of the 20-year period, only 25%, 9% and 14% of the original trees were present in (*a*) the control, (*b*) the crown-thinned, and (*c*) the low-thinned plots respectively. The rate of reduction in numbers was greater in the first than in the second 10 years, and in the lower than in the upper crown classes in either 10-year period. Associated with this reduction in the growing stock there was a gradual movement of a number of trees into lower crown storeys. With increasing age of the stand, the ratio of dominant trees to all classes of trees becomes greater, so that at an age of 39 years in the natural stand, dominants contribute nearly 60% of the total standing volume. It is concluded that in comparison with the control plot, little has been achieved in treated plots towards producing larger trees or providing intermediate yields of merchantable quantities at earlier ages, in spite of considerable investments in thinning carried for 20 years. It is suggested that, until further information is available, no thinnings should be made in such stands until they are 35 years of age or more, when there should be enough trees to ensure a profitable operation without removing all the large-diameter trees. [Cf. *For. Abstr.* 11 (No. 3385); 13 (No. 550).]

332. HUNG, L.-P. **A study on forest composition during an experiment in thinning standing crops of *Cinnamomum camphora*.** *Bull. Taiwan For. Res. Inst.* No. 29, 1950. pp. 28. 17 refs. [Chin.e.]

The results of 4 grades of thinning (0, 15, 30 and 45%) in an experimental forest are discussed. After thinning, average d.b.h., height, and clear length increased and the coefficient of variation decreased. Crown width on all the plots was small, increasing slightly after light and medium thinning and decreasing slightly after heavy thinning. The average volume was higher after thinning on all plots. The correlation coefficients are tabulated and equations are given for the relationship of height to d.b.h. and crown width to d.b.h. before and after thinning. *From author's summary.*

333. **Stagnated María reacts slowly to thinning.** *Carib. For.* 13 (1), 1952 (16, 39). [E.Span.] (*Rep. U.S. trop. For. Exp. Sta.* 12, [1951?].)

Average annual diameter growth of *Calophyllum antillanum* showed no increase after thinnings in 1949 which left only 80 sq. ft. basal area/acre. More timely thinning, i.e. 5–10 years earlier, would probably have produced better results, but the trees appear to react only very slowly after suppression for many years.

334. **Second thinning made in Piñones Mangrove.** *Carib. For.* 13 (1), 1952 (13–4, 36). [E.Span.] (*Rep. U.S. trop. For. Exp. Sta.* 12, [1951?].)

Preliminary results of experimental thinnings in *Laguncularia racemosa* stands in 1949 show that the control plot had lost in basal area as a result of very heavy mortality caused by excessive competition.

243. *Opening of the Canopy (Increment, Overhead Release and Improvement Fellings)*

See also Nos. 174–5, 241, 352, 365, 406–8, 413, 509–10.

335. **Partial cuttings improve Luquillo forest.** *Carib. For.* 13 (1), 1952 (16–7, 39–40). [E.Span.] (*Rep. U.S. trop. For. Exp. Sta.* 12, [1951?].)

Improvement fellings (i.e. salvaging of overmature timber, harvesting of mature trees, removal of inferior trees, and liberation of sapling and pole stands) made from 1943 onwards were generally beneficial where stands were in a good condition at the start. Where worthless species such as *Euterpe globosa* or *Cecropia peltata* dominated the canopy, their representation has been increased. Where advance regeneration was absent, its development since the fellings has not been marked.

336. CURTIS, J. D. **Response to release of Ponderosa Pine in Central Idaho.** *J. For.* 50 (8), 1952 (608–10). 6 refs.

Study of the growth of 88 residual trees examined 15 years after release showed that where there is 100% release for 25 ft. round a tree, the simple linear equation $y = 7{\cdot}2581 - 0{\cdot}2393x$, where x is d.b.h. in inches (up to 30) at the time of release, expresses the ratio y of diameter growth after release to that before release.

337. YOCOM, H. A. **Estimating the time needed for girdling hardwoods.** *J. For.* 50 (6), 1952 (484). [Southern Forest Experiment Station, New Orleans, La.]

A time study of girdling cull hardwoods indicated that girdling time was related to the number of trees treated per acre (N) and the sum of d.b.h.'s girdled per acre in inches (ΣD). By regression analysis the following equation was derived: Man-hours/acre = $0{\cdot}006005\ (\Sigma D) - 0{\cdot}010066\ (N)$.

338. **Girdling of Yagrumo effective.** *Carib. For.* 13 (1), 1952 (14–5, 37). [E.Span.] (*Rep. U.S. trop. For. Exp. Sta.* 12, [1951?].)

Frill-girdling of *Cecropia peltata* without poisoning gave a satisfactory kill within 12 months.

339. BARNARD, R. C. **Tree killing with ammonium sulfamate ('Ammate').** *Malay. Forester* 15 (3), 1952 (149–50).

Ammate proved much less effective than sodium arsenite (20% kill compared with 81%), and also less effective than 2,4-D sodium salts (42% kill).

245. *Tending of Trees, Pruning etc.*

See also Nos. 174–5.

340. MCLINTOCK, T. F. **Cost of pruning Red Spruce in natural stands.** *J. For.* 50 (6), 1952 (485).

Gives results of a time study in terms of (*a*) pruning time per tree as affected by size and number of branches, and (*b*) costs as affected by number of branches.

341. YOUNG, H. E., and KRAMER, P. J. **The effect of pruning on the height and diameter growth of Loblolly Pine.** *J. For.* 50 (6), 1952 (474–9). 12 refs.

Eighteen 14-year-old Loblolly Pine trees about 35 ft. tall and 6 in. in d.b.h. were selected for uniformity and divided into six blocks, each containing three trees as uniform in size and shape as possible. The three trees in each block were pruned so that the amount of crown left occupied 50%, 35%, and 20% of their total height. Weekly measurements were made of height growth and of diameter growth at four positions on the trunk, for the growing seasons of 1946 and 1947. These positions were breast height, 50%, 65%, and 80% of total height. Rainfall, evaporation, and soil moisture were also measured. The following conclusions were drawn from an analysis of the data: (1) Weekly variations in rate of diameter growth were similar at all four positions on the trunk, but the seasonal trend varied at the different positions. Maximum rate of growth was attained early in the season at all positions, but it soon decreased near the base, although it continued at the same rate during most of the season near the top of the trunk. Increase in diameter began and ceased at approximately the same time at all four positions on the trunks. (2) Size of crown had a marked effect on the amount of diameter growth below the crown, but relatively little effect on growth within the crown. Trees with 50% crowns grew most, and those with 20% crowns grew least in diameter at all but the uppermost position, where they made almost the same amount of growth. Diameter growth decreased with increase in distance below the crown with all sizes of crown, the reduction increasing as the size of the crown was decreased by pruning. Trees with 20% crowns increased only one-sixth as much in diameter near the base as near the top, but the increase in diameter of trees with 50% crowns was nearly half as large near the base as near the top of the trunk. (3) Increase in cross-sectional area of the trunk was similar near the top for all sizes of crown, but it decreased with distance below the crown in trees with small crowns, and showed little change in trees with large crowns. The distribution of growth on tree trunks tends to make their shape cylindrical below the crown and conical within the crown. This tendency is more pronounced in trees with small crowns than in those with large crowns. (4) Height growth, for the range of crowns studied, was not affected by the reduction in size of crown. (5) Height growth started a few days before measurable diameter growth occurred in the spring, but it ceased about the first of August, while diameter growth continued until about the first of October. *Authors' summary.* [Cf. *For. Abstr.* 14 (Nos. 174–5).]

342. SMITH, R. H. **Branch control of Beech.** *Quart. J. For.* 46 (3), 1952 (161–5). 6 refs.

Examination was made of a large number of Beech logs from various parts of the North and South Downs, including many, to all external appearances, of the highest quality, which on the saw bench proved to be full of hidden defects. It was clearly established that the great majority of large branch wounds in the bole of the tree were actual points of fungal entry, and that in trees with the fastigiate branching habit, galls and even pockets of leaf mould were incorporated. A high % of the older trees growing to-day are of the fastigiate type and it seems reasonably certain that they result from the indiscriminate collection of seed from parent trees of similar character which often produce most prolifically. Seed trees of this type should be avoided. The characteristics to aim at are flat branching and a central axis; trees of this type start with a good form which can be controlled and encouraged by careful silviculture. German experience has shown that: (1) it is safe and easy to prune green branches of not more than 3 cm. diameter; (2) there is a reasonable chance of safety when natural or 'self pruning' is allowed to occur in branches of 3–6 cm. diameter but not when artificial pruning takes place; and (3) there is serious danger of infection when any branch of more than 6 cm. diameter is allowed to die either naturally or artificially. It is recommended that pruning should start when trees are ca. 15 ft. high and that only vigorous ones should be treated. By the time they are 25 ft. high, 12 ft. of clear bole should have been secured. Careful thinning and control of grey

squirrels are also vital to the success of Beech woods in England. [Cf. *For. Abstr.* 6 (No. 166).]

343. GLATTFELTER, C. F. **Report on bud-pruning of forest trees.** *Pa. For. Wat.* 4 (3), 1952 (52–3, 71).

Plots were established in 1950 to test the effects of bud-pruning on *Pinus strobus*, *P. resinosa* and *Larix leptolepis*. The bud-pruned trees had all the lateral buds removed by hand; lateral branches were left for a height of 1½–2½ ft. above the ground. Other trees were completely pruned of their lateral branches as well as being completely bud-pruned. In 1952, trees not previously treated were pruned of the one-year-old twigs only. Pruning of the entire stem seems successful in that the trees are still alive, but it is too early to judge the effects on height and diameter growth. Larch proved particularly difficult to bud-prune successfully, and it was decided to change over to the pruning of 1-year-old twigs. There is also evidence, that twig pruning may be better than bud pruning on the Pine. [Cf. *For. Abstr.* 12 (No. 1124).]

344. NICHOLSON, D. I. **Bud pruning of plantation Pines.** *Aust. For.* 15 (1), 1951 [1952] (57–61 + 7 photos). 10 refs.

Gives details of experiments on *Pinus radiata* and *P. ponderosa*, and the disadvantages of the method. [Cf. *For. Abstr.* 13 (No. 3841).]

25. TREATMENT OF DEFECTIVE, DERELICT OR VERY OPEN STANDS

See also No. 223.

345. TREPP, W. Die Pflanzensoziologie im Dienste der Aufforstungen und der Wald-Weide-Ausscheidungen im Gebirge. **[Plant ecology in the service of afforestation and woodland/pasture management in mountains.]** *Schweiz. Z. Forstw.* 103 (6/7), 1952 (185–201 + 5 photos). [G.f.]

Illustrates the use of ecology in practical forestry by the example of an area of degraded Spruce wood, Alder scrub, Rhododendron/*Vaccinium* bush, and poor pasture in the Alps, where the treatment to be given in each case was decided by the existing vegetation type.

346. BABOGREDAC, D. Melioracija degradiranih sastojina u bosutskom području. **[Improvement of degraded stands in the Bosut river valley.]** *Šum. List* 76 (5/6), 1952 (153–60). 1 ref. [Croat.e.]

Since ordinary natural or artificial regeneration of such degraded Oak woods [cf. *For. Abstr.* 11 (No. 2232)] does not succeed, the author suggests the introduction of an understorey consisting of moderately shade-bearing species, e.g. Hornbeam, Maple, Lime, and Robinia, planted as 4- to 5-year-old plants.

26. FORESTRY IN AGRICULTURAL AND PASTORAL AREAS (INCLUDING SHELTERBELTS AND THEIR TREATMENT)

261. *Alternate Forestry and Agriculture, Periodic or Temporary Agricultural Use of Forest Land*

347. SHAH, S. A. **Economics of shifting cultivation in South Konkan.** *Indian For.* 78 (8), 1952 (417–22). 2 refs.

266. *Shelterbelts, Windbreaks*

See also Nos. 17, 56, 315.

348. LINDE, R. J. VAN DER. De ontwikkeling van het beschutte cultuurlandschap in de voormalige heidegebieden van West-Jutland. **[The development of agricultural land sheltered [by windbreaks] in the former heath areas of West Jutland.]** *Repr.* from *Tijdschrift der Nederlandsche Heidemaatschappij, Arnhem* May–June, 1952. pp. 17. 18 refs. [Du.]

Outlines briefly the development of shelter planting, discusses the results of laboratory and field measurements of reduced wind speed and increased crop yield, and lists, with discussion of their merits, species used in shelterbelts and hedges.

349. STEUBING, L. Der Tau und seine Beeinflussung durch Windschutzanlagen. **[Dew and the influence of windbreaks on it.]** *Biol. Zbl.* 71 (5/6), 1952 (282–313). 34 refs. [G.g.] E.M.B.

Measurements of dewfall and evaporation were made on bare soil, and on various crops in the open and in the shelter of hedges and windbreaks. Results are shown in graphs and tables. The dewfall in areas sheltered from the wind was up to 200% greater than on open ground; the difference was less in weather favourable for dewfall than on windy nights. The relative air humidity was also higher in sheltered areas. Evaporation caused by night winds was found to be lower in sheltered areas. The heaviest dewfall was found over distances, on the lee side, of 2–3 times the height of the hedge or windbreak. The greatest increase in dewfall occurred where the hedges ran at right angles to the prevailing wind. Measurements on winter wheat and rye have shown that grain and straw weight and straw length are greatest up to distances of 2–3 times the height of the hedge. A study of agricultural weeds in hedged fields after the crop was harvested showed that the composition of the plant communities varied with the distance from the hedge. An area with open hedges had more weeds than an area with close hedges; this suggests that wind-borne seeds are trapped in the hedge, where they fail to germinate or the seedlings are suppressed.

350. BJALYĬ, A. M. Počvennye uslovija pod lesnoĭ polosoĭ. **[Soil conditions under shelterbelts.]** *Agrobiologija* 1950 (4); (133–7). [Russ.] A.P.B.

Tabulates and discusses the results of studies made in 1949 on the Nansen Sovkhoz, Arkadak district, Saratov, under shelterbelts of various ages, in fields adjacent to shelterbelts, and in fields on the open steppe, all with the same soil—a clayey chernozem of medium depth. Old shelterbelts (50–60 years) were richer in humus, N and P, than field soils, the effect increasing with age. A field adjacent to a shelterbelt showed the same differences, though to a smaller degree, as compared with a 9-year-old shelterbelt and with a field on the open steppe. The humus in the top 20 cm. of soil under the shelterbelts had a higher content of humin and ulmin acids (products of bacterial action) than of crenic and apocrenic acids (fungal action). The % of water-stable soil aggregates > 1 mm. increased with increasing age of the shelterbelts, and was greater in cereal and grass fields adjacent to shelterbelts than

in those on the open steppe. Under old shelterbelts of the same age but different species, the % of water-stable aggregates was highest for Oak, followed by Birch and then by Pine. Soil moisture on 30 May decreased in the order: 60-year-old, 50-year-old and 9-year-old shelterbelt, rye field adjacent to shelterbelt, rye field on open steppe.

351. SCHRÖDTER, H. Zur phytopathologischen Problematik von Windschutzanlagen. **[Plant diseases and shelterbelts.]** *NachrBl. dtsch. PflSch-Dienst.* 6 (5), 1952 (91–2). 4 refs. [G.g.]

Discusses, on the basis of recent Soviet and German literature, the possible effects of windbreaks on the spread of disease among crops, and describes briefly some inconclusive experiments by the author with *Alternaria* sp. on *Brassica* sp.

268. *Pastured Forests. Grazing on Forest and Open Ranges. Forage Plants etc.*

See also Nos. 25, 317, 345, 356, 406, 409–11, 880.

352. CASSADY, J. T. **Grass production doubled by control of scrub Oak.** *J. For.* 50 (6), 1952 (463–4).

In a Pine plantation in Louisiana [cf. *For. Abstr.* 13 (No. 2120)] the yield of bluestem forage grasses more than doubled within 3 seasons after control of scrub Oaks. With well managed grazing, this increase in forage can repay most of the cost of hardwood control before the Pines reach merchantable size.

353. RHODES, R. R. **Timber and forage production in a Pine/hardwood stand in Texas.** *J. For.* 50 (6), 1952 (456–9). 10 refs.

Unmanaged Loblolly Pine/hardwood stands with 90–115 sq. ft. of basal area/acre appear to produce the best combination of wood volume, forage and browse. During the seasons of 1947 and 1948 when the study was made, precipitation was deficient, but annual production of wood was 41 cu. ft., herbaceous forage 51 lb., and browse (mostly shrubs) 205 lb. per acre.

27. ARBORETA. ARBORICULTURE FOR ORNAMENTAL PURPOSES. HEDGES AND HEDGE PLANTS

354. EDLIN, H. L. **Town trees.** *Quart. J. For.* 46 (3), 1952 (153–61 + 4 photos).

Discusses the obstacles to growing street and garden trees in towns and recommends species and methods calculated to overcome these difficulties.

355. GROVES, G. R. **Trees, shrubs, palms, and succulent plants [suitable for ornamental planting in Bermuda].** *Bull. Dep. Agric. Bermuda* No. 26, 2nd ed., 1951. pp. 58.

28. HUSBANDRY OF FOREST PRODUCTS OTHER THAN WOOD

See also section 89.

282. *Bark Crops*

See also Nos. 529, 862–4, 880.

356. NATIVIDADE, J. VIEIRA. Sobreiraís do sul e do sudoeste de Espanha. **[Cork Oak forests of southern and south-western Spain.]** *Bol. Junta nac. Cortiça, Lisboa* 13 (157), 1951 (3–10); 14 (158), 1951 (33–45); 14 (159; 162–4), 1952 (60–70; 147–53; 175–85; 204–9, xli–xlii, 27). 16 refs. [Port.e.f.]

Summarizes impressions from a journey made in 1951, and reviews the history of the Cork Oak forests in this region, the causes of their degradation, their extent, soils, and associated vegetation. Information is given about the distribution and extent of the stands, the composition of mixed stands and their density. Problems of regeneration, of burning, pasturage and soil treatment are considered and the principles and methods are briefly described of pruning, stripping, felling, pest control and management of public forests.

284. *Crops Tapped for Exudations*

See also Nos. 873–4.

357. TERZIĆ, D. Resultati jednogodišnjeg eksperimentalnog smolarenja na smrči. **[Results of a year's experimental resin-tapping of Spruce.]** *Godišnj. Inst. nauč. šumar. Istraž., Sarajevo* No. 1, 1951 (200–10). [Croat.f.russ.]

Results of a small-scale experiment using HCl (31·8%) and HCl (31·8%) + 10% of $CaCl_2$ on German faces are given in graphs and tables. HCl with an 8-day tapping cycle proved best.

358. MACHADO, D. PEREIRA. Estudo do aumento da exsudação de gema no pinheiro bravo pela acção estimulante do ácido sulfúrico e de novos processos de resinagem. I. Ensaios e resultados preliminares. **[Study of methods of increasing resin flow in *Pinus pinaster* by stimulating with sulphuric acid, and of new tapping methods. I. Experiments and preliminary results.]** *Publ. Serv. flor. aqüic. Portugal* 18 (1), 1951 (15–24 + 1 plate). 25 refs. [Port.port.e.]

Trials by the Forest Service in the acid stimulation of *Pinus pinaster* tapped by the Hugues method, and in the American 'bark chipping' process, have been in progress for 2 years. It is too early to draw definite conclusions, but increased yields have been obtained by spraying with 50% H_2SO_4. Good results have also been obtained with the American 'bark chipping' methods, both with faces 18 cm. wide and with faces 9 cm. wide.

359. DAVID, R. L'influence de gemmage sur la répartition de l'oléo-résine dans le bois du pin maritime. **[The effect of resin tapping on the distribution of oleoresin in the wood of *Pinus pinaster*.]** *C.R. Acad. Sci., Paris* 234 (27), 1952 (2635–7). [F.f.] O.R.S.

Resin tapping with or without acid stimulation causes formation of oleoresin in the lumina of tracheids near the wound. Tabulated figures showing the depth of the wood with tracheids containing oleoresin at different points in, above and alongside the face, show that more tracheids containing oleoresin are present when acid stimulation is used.

360. DIJKMAN, M. J. ***Hevea*: thirty years of research in the Far East.** University of Miami Press, Coral Gables, Florida. 1951. pp. xxii + 329. Many refs. Price $6·00. E.M.B.

A detailed account of techniques of rubber cultivation in Indonesia, which includes information

on the use of other tree species (especially *Albizzia falcata* and *Leucaena glauca*) as soil improvers, shade trees and for erosion control in the plantations.

286. *Osier-Growing*

361. Dansk piledyrkerforening: beretning for året 1950/51. **[The Danish Osier-Growers' Association: report for 1950/51.]** *Dansk Skovforen. Tidsskr.* 36 (9), 1951 (500–4). [Dan.]

Includes an account of some manuring experiments made by individual growers. N applied to 10-year-old Willows as $Ca(NO_3)_2$ at a rate of 600 kg./ha. gave an increased yield of about 9 tons, which at Kr. 250/ton for green osiers, gives a profit. An increased yield of 5 tons from manuring with superphosphate at 600 kg./ha. + K at 600 kg. + $Ca(NO_3)_2$ at 800 kg. was not sufficient to pay for the fertilizers but is a useful indication of the value of phosphate in increasing yields from the other two fertilizers.

362. Lorentzen, S. Forsøg med udtynding av fleraarig pil (*Salix viminalis*). **[An experiment on thinning *S. viminalis*.]** *Dansk Skovforen. Tidsskr.* 36 (12), 1951 (623–33). [Dan.]

A thinning was made in a 1-year-old crop on an area containing 10 rows 15 m. long. Forked and knotty shoots and those less than 1·8 m. high were removed, mainly from the stools with the greatest number of shoots. Of 2487 shoots on 567 stools, 1730 were removed, a weight of 90 kg. or about ½ the total weight. Of the remaining 757 shoots, there were 727 more than 1·8 m. high and knot-free. A similar area was left unthinned. Both areas were harvested in autumn 1950 and the crop was sorted into (1) rods suitable for hoops on butter casks etc. (length over 1·8 m., diam. over 18 mm. at 10 cm. from the butt end), (2) rods which with further growth would have reached hoop dimensions (length over 1·8 m., diam. under 18 mm.), and (3) all other rods. Results show that on the thinned plots 343 rods (45·3%) reached hooping dimensions, giving a yield of 16,500 kg./ha. or 37·6% of the total production, while the corresponding figures for the unthinned plot were 268 rods (26%) with a yield of 11,778 kg./ha. or 30·1%. Measurements of 32 rods from each area show a diameter increment in the year after thinning of 5·1 mm. on the unthinned and 6·8 mm. on the thinned plot. The profit per ha. (after deduction of labour costs) on the thinned plot was estimated at Kr.2479·90 as against Kr.2120·04 on the unthinned plot; probably the actual increase in profit through thinning would be rather higher because cutting should be quicker in thinned beds. [Cf. *For. Abstr.* 9 (No. 2495).]

3. HARVESTING OF WOOD, LOGGING AND TRANSPORT. RATIONALIZATION OF WORK; WORK STUDIES. FOREST ENGINEERING

See also Nos. 597–8.

32. FELLING AND RELATED OPERATIONS

321. *Marking*

See also No. 386.

363. Downs, L. E. **A paint spray nozzle for marking trees.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*1914, 1952. pp. 4 + 7 dgms. P.R.

The nozzle, for use with the spray cap of pressurized paint cans, is long enough to project over the side of the can, so that the tip can be held close to the tree. It has a long bore, very small in diameter to reduce the flow and prevent very heavy paint deposits. Thus the paint reaches the tree before the spray cone has become too wide to form legible identification marks.

322. *Preparatory Measures*

See also Nos. 509–10, 787.

364. Beltram, V. L'exploitation estivale de l'épicéa. [**Summer felling of Spruce.**] *Schweiz. Z. Forstw.* 103 (8), 1952 (293–7). [F.f.g.]

Spruce is usually cut in early summer in the mountains of Slovenia, barked to 7 cm. top diameter and left to dry with the crown intact. In September the crown is cut off, and the trunk cut into 4-m. logs for ease of transport to the valley. It is generally considered that wood left in this way in the forest dries better and without checking, and weighs less than wood cut into lengths directly after felling. In order to test this, experiments were made on a number of trees from two sites. These were divided into three groups and treated as follows: (1) barked to 7 cm. top diameter and left with crown intact; (2) barked to 7 cm. top diameter and crown removed; (3) barked and cut into 4-m. logs. All groups were left lying in the forest until September and were weighed immediately after felling and at intervals of one month. At the end of the period it was found that (3) was 8% heavier than (1) or (2) between which there was little difference. (1), however, showed considerable barkbeetle attack. It is concluded that leaving the crown intact does not assist drying but does encourage barkbeetles; that tree-length logs dry better than 4-m. logs; and that the same results are obtained at different altitudes (there was no difference between site A at 1150 m. and site B at 270 m.). The greater moisture content of the short logs is attributed to the fact that their whole length is in contact with the ground.

365. Arend, J. L. **Bark loosening effects with 2,4-D, 2,4,5-T and ammate.** *Pulp Paper Mag. Can.* 53 (7), 1952 (159 . . . 164).

The chemicals were tested on *Populus tremuloides*, *P. grandidentata*, *Acer rubrum*, *Quercus alba*, and *Q. ellipsoidalis*, and were applied as basal sprays, and (in the case of ammate) in notches, cups or girdles cut at the base of the tree. Nearly 100% top kill was obtained with the ammate crystals, and 70–100% with the 2,4-D and 2,4,5-T sprayed up to a height of 4 ft. Coppicing was observed in many trees in the second growing season. The chemicals did not facilitate bark removal except in *A. rubrum*.

323. *Felling and Subsequent Primary Conversion*

See also Nos. 364, 373–7, 672–3, 787.

366. **New tractor attachment for felling trees.** *Sth. Lumberm.* 184 (2303), 1952 (91–2).

A standard bulldozer attachment known as the Fleco Tree Cutter has been developed by the Caterpillar Tractor Company and Florida Land Clearing Equipment Company. The cutter is designed for use on trees 15–17 in. diameter at base, but has been used successfully on a Pine 28 in. in diameter. It can be made in widths to fit any large tractor, the cutting edge being usually from 10 to 12 ft. across. A tractor using the attachment moves forward at 2–3 m.p.h. in second gear. There is a tension bar set about 6 ft. above and 6 in. in advance of the cutting edge. This presses against the tree trunk keeping the fibres taut so that the cutter (set at ground level or any desired height) can slice smoothly through the trunk. The first cutter, which has been in use for 6 months, is still serviceable; it is sharpened periodically by grinding. The equipment is shown in photographs.

367. Simmons, F. C. **Harvesting fuelwood in stick form.** *Proc. U.S. For. Prod. Res. Soc.* 5, 1951 (182–7).

Fuelwood production in the north-eastern U.S.A. can be rationalized and made economic by tractor-hauling tree-lengths to some convenient point for cutting up and loading with modern equipment. The author briefly reviews suitable equipment for both large and small operators—e.g. cross-cutting saws and trestles, tractors and tractor attachments, splitting devices (special machines, explosive wedges, ripsaws) and aids to loading and handling—and analyses costs and recipts for a farm-woodlot and a commercial fuelwood operation.

368. Rathert, W. H., Wilson, L., Murray, H. L., Wilson, C. A., and Martin, D. W. (to J. Neils Lumber Company). **Log bucking chute.** *U.S. Patent* No. 2,563,867, Aug. 14, 1951. pp. 5 + 17 dgms. P.O.

A chute with a lengthwise log conveyor chain for handling tree-length logs at a loading station, enabling cross-cutting into merchantable lengths to be carried out under the immediate supervision of a single scaler.

369. Jacquiot, C. Principes d'une méthode biologique d'écorçage des bois de taillis. [**The principles of a biological method of barking coppice wood.**] *Rev. for. franç.* 1952 (7/8), (513–4). 2 refs. [F.]

The author's researches on bark of hardwoods removed in winter and cultivated *in vitro* [cf. *For.*

Abstr. 12 (No. 1900); 13 (No. 1051)] have shown that cambial activity is resumed at a temperature of ca. 25° C. and with a plentiful supply of water. He suggests that if coppice wood cut in winter were placed standing on end in vessels full of water, in a temperature of 25°, within 5 weeks of cutting, it would bark as easily as spring-felled wood.

33. DEGREE OF UTILIZATION AND WASTE. CLEARING THE FELLING SITE

See also No. 366.

370. ANDREWS, L. R. **The effect of development in harvesting and manufacturing methods and equipment on utilization and forestry practices.** *B.C. Lumberm.* 36 (8), 1952 (36–8, 105 . . . 122).

A paper read at the 6th British Commonwealth Forestry Conference, Ottawa. Increased selling prices and mechanization, and improved manufacturing and marketing techniques, especially since 1947, have led to an increase in recovery of an estimated 25–30% greater volume of usable wood from each acre of coast forests harvested in British Columbia.

371. **New portable power brushcutting tool.** *Pulp Paper Mag. Can.* 53 (8), 1952 (120).

The Haug Brushcutter is being produced in Canada by the Godfrey Engineering Company Ltd., 480 Metropolitan Blvd., Montreal. The unit is powered by a light-weight 1½-h.p. petrol engine carried on anti-vibration mountings on a pack board strapped to the operator's back. The drive is transmitted by V-belts to a 10-in. circular saw blade carried on an extension arm of fibre tubing. The operator manipulates the saw blade by a handle on the extension arm, and the blade can be made to cut at any angle from ground level to 2 ft. overhead, but the construction of the extension arm joints is such that the operator cannot swing the blade in towards his body. For underbrush and trees up to 3 in. thick the blade is scythed in an arc close to the ground. Large trees up to 8 in. can be felled by several cuts from different sides of the tree. The unit weighs 40 lb.

34. STORAGE IN THE FOREST AND AT LOG DUMPS

See Nos. 781–2, 788–9.

35. RATIONALIZATION OF WORK. WORK STUDIES

See also Nos. 337, 378.

372. Allgemeine Anweisung für Leistungsuntersuchungen (Zeitstudien) bei der Waldarbeit. **[General directions for performance studies (time studies) in forest work.]** Institut für forstliche Arbeitswissenschaft, Vorwerksbusch, Reinbek bei Hamburg. 1950. pp. 12. [G.]

373. ZEHNDER, J., SOOM, E., and AUER, C. Untersuchungen über Holzhauerei im Gebirge. **[Researches on logging in mountain forests.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 27, 1951 (76–246 + 8 photos). 66 refs. [G.g.f.]

The studies reported on were carried out in Grisons with two main objects, to obtain information on which (1) to base improvements in tools, methods and organization of work, and (2) to estimate fairly and accurately work done and remuneration earned by the workers. Much of the report is also concerned with the methods of planning and executing time studies. The operations studied were confined to felling and primary conversion. The data obtained are set out in 42 tables and 22 diagrams and graphs. The most striking result of the studies was the close correlation between the expenditure of work on felling and conversion of a tree and its d.b.h. It was found that 70–80% of increase in time taken on an operation was due to increase in d.b.h. and only 20–30% to other factors. It is therefore suggested that the stem rather than the cu.m. should be adopted as the unit of calculation. D.b.h. can be measured on the standing tree and the workman can estimate the work to be done more accurately and easily in terms of a tree than of a theoretical volume. The use of this conception in the calculation of remuneration is discussed in detail, and a method of calculation based on it is worked out.

The remainder of the study is devoted to the elucidation of other factors affecting logging in the mountains. Choice of tools was found to be of great importance. The superiority of the saw with raker teeth over the common peg-tooth saw was strikingly confirmed; production was 23% better for all operations and 36% better for felling alone. [See next abstract.]

The relatively slight effect of steepness of terrain on working time was surprising (an easy gradient gave only 7% advantage over very steep slopes), and it is concluded that this is due to the fact that the studies were made on men habituated to mountains. The steep slopes would probably have much more effect on the working time of plainsmen.

Studies on the number of men in a team did not give decisive results, but, on the whole, the output per man of the 2-man team was not inferior to that in more numerous teams, even for skidding, and the other advantages of the two-man team (diminished risk of accidents, and ease of assembling the team) are in favour of its general use.

Studies of output by regular and seasonal workers showed that the former took 6% less time than the former for all operations, and 11% less for felling alone. Seasonal workers had twice as much waiting time as regulars. Logging damage to the residual stand was in the proportion 1 : 31, and skidding damage 12 : 37, in favour of regular workers. The desirability of training courses, or even regular apprenticeship, for forest workers is indicated.

374. ZEHNDER, J., WEBER, A., and LINDER, A. Étude du rendement des scies par les méthodes statistiques. **[Study of saw performance by statistical methods.]** *Mitt. schweiz. Anst. forstl. Versuchsw.* 27, 1951 (1–18 + 3 photos). 4 refs. [F.f.g.]

Report on a time study of 2 specimens each of 3 types of logging saw: (*a*) cross-cut saw 8 cm. wide with raker teeth and groups of 4 lance-shaped cutter

teeth, (*b*) as (*a*) but with pairs of ordinary shaped cutter teeth, and (*c*) the Sandviken model 915, 12-cm. cross-cut saw with raker teeth and groups of 4 cutter teeth joined in pairs. The paper is concerned mainly with the lay-out of the experiment and the analysis of the results. It was found that (*c*) gave a consistently better performance than (*a*) or (*b*); there was no significant difference between (*a*) and (*b*); there was no difference in performance between the two saws of each type on the first day of the study, but after sharpening on the second day there was a difference between the two saws of type (*b*).

375. Aro, P. Waldsägeuntersuchungen in den nordischen und mitteleuropäischen Ländern. **[Investigations on forest saws in the countries of northern and central Europe.]** *Acta for. fenn.* 57 (3), 1950 (1951). pp. 176. Many refs. [G.fi.]

A review of research on hand saws and sawing in Germany, Switzerland, Sweden, Denmark, Norway, Finland and Russia, covering types of saw, research methods, results of investigations on performance and rate of work, the effect of different factors on performance and some practical conclusions on saw tensioning, tooth arrangement, sharpening, and maintenance. Tables are given summarizing data on saws and performance results obtained in 29 investigations between 1861 and 1942.

376. Smith, C. Forsøg med eenmandsmotorsav. **[Experiments with a one-man motor-saw.]** *Dansk Skovforen. Tidsskr.* 36 (10), 1951 (505–14). [Dan.]

Results of experiments showing cu.m./hr. and Kr./hr. for cross-cutting Beech (average diam. 25·5–33·7 cm.) and Oak (average diam. 40 cm.) using a Jo-Bu motor saw or a hand saw are tabulated; output and costs/hr. are both higher for the Jo-Bu. The Jo-Bu was not found suitable for felling trees over 30 cm. diam. Economic considerations are discussed and figures are tabulated, showing the daily cost, using a motor-saw in 1-, 2- or 5-man crews, and allowing for fuel, amortization, repairs, and increased waste caused by the wider saw-cut. These figures show that the value of the increased production will be greater than the increased costs.

377. Hart, A. C. **A table of production rates for cutting Spruce and Fir pulpwood.** *J. For.* 50 (7), 1952 (557–8).

A table has been compiled by the Northeastern Forest Experiment Station showing in man-hours/cord the time taken to cut pulpwood of d.b.h. classes 5–19 in. (1) rough and (2) barked, and (*a*) piled at stump, (*b*) skidded to a yard.

37. TRANSPORT

378. Hafner, F. Die Praxis des neuzeitlichen Holztransportes. **[The practice of modern timber transport.]** Georg Fromme & Co., Vienna. 1952. pp. viii + 295. 93 refs. [G.] Price *Sch.*88.

Contains sections on skidding, loading and storing techniques, long-distance timber transport, planning of exploitation of large forest areas and of timber transport from these areas, and evaluation of the economic efficiency of machines, draught animals and installations. There are 100 photos.

372/377. *Land Transport*

See also Nos. 8, 40, 218, 367–8, 576.

379. Mégille, X. de. Les derniers progrès dans le débardage direct des coupes par cables aériens. **[Recent progress in the direct haulage of logs from felling sites by means of overhead cableways.]** *Rev. Bois Appl.* 7 (7/8), 1952 (12–7). 12 refs. [F.] P.R.

Describes and illustrates modern methods used in France, Switzerland, and the U.S.A.

380. Lloyd, A. H. **Timber extraction from difficult sites: the use of modern cableway systems.** *Wood* 17 (6), 1952 (218–20). [Imperial Forestry Institute, Oxford.]

Describes the Wyssen and Lasso systems and their use. [Cf. *For. Abstr.* 12 (No. 2097).]

381. Slovnik, M. O preprostih motornih izvlačilcih. **[Simple light cableways with motor winch.]** *Les, Ljubljana* 3 (9/10), 1951 (169–74). [Sloven.]

A detailed account of a light cableway for uphill skidding in Slovenia. Owing to its simple construction, it is said to be better suited to local conditions and more efficient than the Wyssen, Câble-Cran or Lasso-Câble systems. The skyline cable is 18–24 mm. in diam., the hauling cable, 9–12 mm. The carriage is a Spruce bolt 270 cm. long and 18–20 cm. thick, suspended from the skyline by means of two pulleys fixed one at each end of the bolt. The under side of the bolt is fitted with a pulley at the end nearest the motor (the uphill end), and with a strong hook at the far end. The hauling cable, its end attached to the carriage hook, passes through a free fall-block having a hook for the log load, and then over the pulley on the under side of the carriage. A few modifications of the carriage are described. The load can be attached with wire or chain in the ordinary way, or for small wood a special crate can be used. The motor power for the winch should be ca. 18–30 h.p. The following times are given for various operations: lowering the carriage (by gravity) for a distance of 640 m., 2 min. 10 sec.; lowering the fall block, 1 min. 15 sec.; attaching the load, 1 min. 25 sec.; pulling the load in to the skyline, 1 min. 30 sec.; hoisting the load along the skyline (640 m.), 15 min. 10 sec.; and lowering and disconnecting the load, 30 sec.—totalling 22 min. The maximum load is 2·5 tons, the average load 1·2 cu.m. and the output per 8-hour shift 19–22 cu.m. The cost per cu.m. is not quite ½ of the cost of horse transport. Four cableways of this kind (planned capacity 1750 cu.m., actual capacity 550–750 cu.m./month) are now working in Slovenia.

382. Vergneau. La vidange par Câble-Lasso. **[Extraction of timber by the Câble-Lasso.]** *Rev. for. franç.* 1952 (7/8), (460–4 + 1 photo). [F.]

Describes the use of a Câble-Lasso [cf. *For. Abstr.* 9 (No. 965); 10 (No. 1973)] in the communal forests of the Vallée de la Thur (Haut-Rhin), with figures for performance, cost etc.

383. Tufts, D., and Mety, B. **Truck transportation of logs in Southeast Arkansas.** *Proc. U.S. For. Prod. Res. Soc.* 5, 1951 (13–6).

The current methods of log transport are described, along with a discussion of the economics

of logging by lorry. The costs of 2- and 3-ton lorries are compared with those of a 6-ton lorry with emphasis on volumes hauled, distance, and class of road. The cost and performance figures are based on the experience of local operators. *From authors' summary.*

384. KILPINEN, L. Vanerikoivun syysajosta. **[Hauling Birch logs in the autumn.]** *Metsät. Aikak.* 1951 (2/3), (57–8). [Fi.e.]

Hauling trials made before the first snowfall using 2 Norwegian and 2 Finnish skidding devices (described with illustrations) were sufficiently promising to justify further investigation.

385. **New tractor has varied logging and mill uses.** *Timberman* 53 (9), 1952 (91).

The most important feature of the new tractor, the 'Power Horse', is the independent axle for each wheel, back and front wheels being joined by truck roller chains. Steering is done by control levers, which can reverse wheels on one side, and forward them on the other, so that complete pivot turns are possible in less than the length of the tractor. The 'Power Horse' is manufactured by Harris Manufacturing Co. and distributed by Crockett Bros., 2932 N. Wilson Way, Stockton, Calif.

378. *Water Transport*

See also No. 818.

386. VILLIKKA, P. Uittotavaran merkitsemisestä maalimerkeillä. **[Marking timber for floating with paint.]** *Metsät. Aikak.* 1952 (3/4), (109–12, 115–6). [Fi.e.]

Tests by Metsäteho on substitution of paints for cut marks have given the following results: (1) Celledur as an end mark remains on Pine and Spruce logs well and on Birch fairly well; it penetrates into the end of the log and thus resists friction, but it does not remain on very resinous logs. As a side mark it remains fairly well, but does not adhere closely, and its resistance to friction is therefore small. (2) Mark-Color holds well and resists friction as both a side and end marking in all conditions. (3) Red-Ochre mixture lasts well as an end mark on dry Spruce and fairly well on dry Pine and Birch. Its resistance to friction is good, but resin penetrates and removes the paint. It does not adhere as a side mark. In general, painted marks must be dry before the logs are rolled into the water. Resistance to friction is only important as regards resistance to wear by water. Paints can only be used as side marks on fully barked timber.

387. DALMATOV, JA. B. Ulučšatj konstrukcii plotov. **[To improve the design of timber rafts.]** *Lesn. Prom.* 1950 (3), (9–10). [Russ.]

Describes some improvements in timber rafts invented by the author in 1935 and used in the U.S.S.R. The rafts consist of 2–3 large, rigid, streamlined sections with flexible connections.

388. LÄHTÖNEN, H. Tähänastiset kokeilut uittoveneiden standardisoinnissa. **[Experiments in standardizing boats used in floating.]** *Årsb. Finl. Flottaréfören. 1951*, 1952 (58–66). [Fi.e.]

Reports on results achieved in Finland in standardizing the main parts of warping boats and tugs.

38. FOREST ENGINEERING

383. *Roads and Bridges*

See No. 40.

385. *Drainage, Irrigation, Sedimentation. Water Supply*

389. LJUNGLÖF, K. Dikessprängning. **[Draining by explosives.]** *Norrlands SkogsvFörb. Tidskr.* 1951 (2), (136–47). [Sw.]

Draining an area of 195 ha., by blasting 15,538 linear m. of drains, cost Kr.1·27/m. for labour and explosives or Kr.101/ha., giving a saving of 41% on the estimated cost of manual labour for the total area and of 82% on the estimated time. An average of 0·329 kg. explosives/m. was used. The saving was greatest on heavy soils but was also quite extensive on lighter soils, especially those with deep wet peat, where the cost for manual labour was Kr.1·53 and for blasting Kr.1·01/m. Training of personnel, regulations for storing and transporting explosives, and safety precautions are discussed. [Cf. *For. Abstr.* 13 (No. 3955).]

386. *Waterways. Stream Training*

390. RICHTER, H. Die Grosswasserkraftwerke in Österreich und ihre Auswirkungen auf die Forstwirtschaft (Wildbachverbauung). **[Hydraulic engineering in Austria and its effects on forestry (torrent training).]** *Forstwiss. Cbl.* 71 (3/4), 1952 (88–97). [G.]

Discusses the dangers of an unregulated water table in mountainous areas, work achieved in hydraulic engineering in Austria, and the rôle of forests in maintaining an equilibrium, and includes a short account of the catchment scheme in the Reisseck-Kreuzeck region of Carinthia.

41. GENERAL TECHNIQUE OF FOREST PROTECTION. TYPES OF INJURY

411. *Natural and Biological Control*

See Nos. 481–2, 492, 496–7, 506–8, 516–9.

414. *Chemical Control*

See Nos. 474–9, 505, 509–10.

42. INJURIES FROM INORGANIC AGENCIES OTHER THAN FIRE

421. *Air Currents*

See also No. 237.

391. MACDONALD, J. M. **Wind damage in middle-aged crops of Sitka Spruce and its prevention.** *Scot. For.* 6 (3), 1952 (82–5).

Gale damage is a serious economic factor on the west coast of Scotland, and Sitka Spruce grown in dense even-aged plantations is particularly vulnerable. Suggested counter measures are the development of irregular and mixed crops by: (*a*) crown thinning, (*b*) strip or group planting, and (*c*) the planting of very small groups widely spaced over considerable areas, relying on natural regeneration to fill the spaces between groups.

422. *Temperature Influences Frost. Heat. Drought*

See also Nos. 237, 435.

392. STONE, E. L. **An unusual type of frost injury in Pine.** *J. For.* 50 (7), 1952 (560–1). 8 refs.

Terminal shoots of many species of Pine in young plantations in New York State were observed to be characteristically bent, and the deformity is attributed to a frost in mid-June 1950.

393. RILEY, C. G., DENYER, W. B., and WHITNEY, R. D. **'Little-leaf' of White Elm.** *Rep. For. Insect Dis. Surv. Can. 1951*, 1952 (142).

Describes dying of *Ulmus americana* in the Prairie Provinces through root injury caused by unusually low temperatures during the winter, following an unseasonably warm autumn.

394. LAMBERT, L. Les lésions des arbres par le gel. [**Frost crack in trees.**] *For. France* No. 39, 1952 (13). [F.] X.

Observations made during a severe frost in Feb. 1939 indicated that frost crack occurs during the early afternoon when the power of the sun is at its height, and usually occurs on the south, or south-west sides of trees.

424. *Soil Conditions. Erosion Effects*

See also No. 260.

395. WILDE, S. A., and VOIGT, G. K. **Determination of colour of nursery stock foliage [for the diagnosis of nutrient deficiencies] by means of Munsell color charts.** *J. For.* 50 (8), 1952 (622–3). 4 refs.

Cf. *For. Abstr.* 13 (No. 2221).

425. *Chemical Influences (Atmospheric)*

See Nos. 414, 479.

43. FOREST FIRES

432. *Prevention and Control*

See also Nos. 8, 405.

396. SALDARELLI, R. Prevenzione e lotta contro gli incendi boschivi. [**Prevention and control of forest fires.**] Servizio forestale, Regione Siciliana, Palermo. 2nd ed., 1950. pp. 31. 8 refs. [It.]

With particular reference to Italian conditions.

397. WRIGHT, W. F. **The protection of rural lands against fire in New Zealand.** *Unasylva* 6 (1), 1952 (4–11).

398. **Air operations handbook. Part 4. Aerial reconnaisssance—fire.** U.S. Forest Service, Washington, D.C. 1952. pp. iv + 46.

[Cf. *For. Abstr.* 14 (No. 579).] Deals with planning, personnel, equipment, operating rules, technique and procedure in the use of aircraft for detecting and locating forest fires.

399. **Air operations handbook. Part 2. Smoke-jumping.** U.S. Forest Service, Washington, D.C. 1952. pp. vi + 94 + numerous photos, dgms.

Deals with all aspects of smoke-jumping (i.e. dropping fire-fighters by parachute) including planning, organization, equipment, personnel, and operating techniques and procedures.

400. HESS, Q. F. **Fighting forest fires with water bombs.** *Pulp Paper Mag. Can.* 53 (6), 1952 (146–8). (*Woodl. Sect. Index Canad. Pulp Pap. Ass.* No. 124 (*F*–3).)

Discusses briefly previous trials in the U.S.A. and Canada [cf. *For. Abstr.* 12 (No. 2313)] and describes in some detail field tests by the Ontario Department of Lands and Forests since 1949. The latest 'bomb' used is a cube-shaped non-leaking paper water-bag holding about 3½ gal. of water. The best height for bombing was found to be about 300 ft., which precludes the use of a conventional bomb sight. Tests showed that about 8 bombs should be dropped during each run over the target, and a conveyor method has been evolved by which 1–8 bombs can be released in quick succession. At 300 ft. and a speed of about 100 m.p.h. the first bomb strikes the ground about 500 ft. ahead of the point of release and the others fall at distances of 15–40 ft. apart. The conveyor, mounted so that the bombs can slide down through the camera hole, is a series of rollers on ballbearings, 6 ft. 10 in. long and about 1 ft. wide. The conveyor and a supply of empty, flattened water bombs are carried by the aircraft on fire-detection patrol and when a fire is discovered the pilot lands at the nearest accessible water, fills the 18 bombs through a 2-in. opening at the top, which seals itself when a strip of cardboard is removed from it after filling, returns to the fire, drops the bombs on 3 runs and returns to fill more bombs. This procedure, which

is continued as long as is necessary, slows up or stops the fire spread until ground crews can reach the fire.

435. *Benefits of Fire Control. Injurious Effects of Fire. Fire Losses*

See also No. 402.

401. MORLAND, R. T. **Notes on the Snow Lease section of Hume Catchment area [of New South Wales].** *J. Soil Conserv. Serv. N.S.W.* 7 (1), 1951 (5–29). 2 refs.

Describes the damage to vegetation and soil caused by fires in the upper catchment of the Murray River. The forest types described include wet sclerophyll forest (*Eucalyptus gigantea* association), alpine sclerophyll forest (*E. dalrympleana*/*E. pauciflora* and *E. pauciflora* associations).

436. *Beneficial Effects of Fire. Uses of Fire in Silviculture and Other Forms of Husbandry*

402. BURNS, P. Y. **Effect of fire on forest soils in the Pine barren region of New Jersey.** *Bull. Yale Sch. For.* No. 57, 1952. pp. 50 + 6 photos. 129 refs.

The author first reviews the literature on the effects of fire on forest soils, and then describes studies made on two experimental areas in New Jersey, one showing the effect of periodicities of burning varying from every year to every 15 years, the other showing the effects of annual burning for periods ranging from 1 to 15 years. The data indicated that moderate burning treatments, i.e. burning every 4 years or 2 annual burns, had much less effect on the soil than did annual burning for long periods. Moderate burning (as defined above) had the following effects on unincorporated organic matter: (1) the weight per unit of area was slightly reduced; (2) the total thickness of the *L* layer was substantially reduced; (3) the thickness of the *F* and *H* layers was slightly decreased; (4) the proportion of area covered with forest-floor material was appreciably reduced, and (5) the % of N and weight of N per unit of area were slightly reduced. The chemical and physical properties of the mineral soil were not appreciably modified by moderate burning.

Annual burning for long periods caused: (i) almost complete destruction of the forest floor, with consequent exposure of mineral soil and loss of N contained in the unincorporated organic matter; (ii) increases in pH, organic matter, N, exchangeable Ca and exchangeable K in the A horizon; (iii) a substantial decrease in rate of infiltration; (iv) slight increases in field capacity and pore volume of the mineral soil; and (v) slight decreases in volume weight and air capacity of mineral soil. No appreciable change in P content was observed.

Consideration of these results leads to the following conclusions: (*a*) Moderate burning treatments benefit the mineral soil chemically and probably have favourable effects on the forest floor. (*b*) Annual burning for long periods has unfavourable effects on the forest floor, but benefits the mineral soil chemically. (*c*) Controlled burning is of little or no importance from the standpoint of the physical properties of the mineral soil. These conclusions apply only to forests having similar climate, topography, vegetation etc. to the Oak/Pine stands of the New Jersey Pine barrens. *From author's summary.*

403. GRUSCHOW, G. F. **Effect of winter burning on growth of Slash Pine in the flatwoods.** *J. For.* 50 (7), 1952 (515–7). 6 refs.

A study carried out on the Osceola National Forest showed that winter headfires caused a marked reduction in the subsequent height and diameter growth of *Pinus caribaea*, but controlled burning by backfires had little or no effect, provided that the trees were 12 ft. high or more.

44. DAMAGE BY HARMFUL PLANTS. VIRUS DISEASES

441. *Weeds*

See also Nos. 237–8, 287–94, 339, 365.

404. NICKELL, L. G. **454 weeds and how to control them.** *Plants & Gardens* 8 (1), 1952 (58–100). 130 refs.

Tabulated information, with bibliography, giving the most effective compounds and their rates of application. The list includes woody species.

405. KUNTZ, J. E., and RIKER, A. J. **Chemical weed control in forest firelanes.** *Abstr.* in *Res. Rep. 8th ann. Nth. Cent. Weed Control Conf.* 1951 (156).

[Cf. *For. Abstr.* 13 (No. 1312).] Re-growth in 1950 and 1951 was more abundant on the previously roto-tilled than on the non-roto-tilled firelanes. Non-roto-tilled firelanes treated in April 1950 with Borascu (20 lb./sq. rod, dry), or with a mixture of 2,4-D (isopropyl ester 5 lb./acre, spray) and TCA (NH_4 and Na salts, 25 and 50 lb./acre, spray) showed sparse re-growth. Re-growth on roto-tilled firelanes was almost normal. Re-treated 1950 plots and newly treated 1951 plots showed excellent weed control with Borascu (10 and 20 lb./sq. rod, dry) and concentrated borax (10 lb./sq. rod, dry). In addition, plots treated in 1951 with CMU (20 and 40 lb./acre, spray), a mixture of 2,4-D (isopropyl ester, 4 lb./acre, spray) and CMU (20 lb./acre, spray), and a mixture of 2,4-D (isopropyl ester, 4 lb./acre, spray) and CIPC (isopropyl-*n*-(3-chlorophenyl) carbamate) (10 lb./acre, spray) were practically bare at the end of the season. Response to CMU was slow. Mixtures of 2,4-D (isopropyl ester, 4 lb./acre, spray) and TCA (10, 25, and 50 lb./acre, spray) gave only fair control in 1951, as compared with excellent control (less than 5% of the check) in 1950. CMU, Borascu and concentrated borax caused severe injury, not only to *Pinus resinosa* transplants and to *Populus deltoides* cuttings planted in the firelanes, but also to adjacent native *Quercus palustris* and *Pinus banksiana*.

406. HANSEN, H. L, **Control of woody plants.** *Res. Rep. 8th ann. Nth. Cent. Weed Control Conf.* 1951 (147–64).

[Cf. *For. Abstr.* 13 (No. 1307.] Brief reports on the year's work in various parts of the U.S.A.

Low volatile esters, widely tried on almost all the common weed species, appear to be as effective as, if not better than, the older forms. Basal spraying

has also figured largely in the trials. August treatments with 1·4% solutions of 2,4,5-T propylene glycol butyl ether esters in diesel oil, applied as basal sprays, effectively controlled *Quercus mohriana*. Both this species and *Q. virginiana* were controlled by basal treatments in August with mixtures of 2,4-D and 2,4,5-T esters at 4·8% acid concentration, and by 1·4% solutions of 2,4,5-T ester in oil applied in basal notches in August. For *Q. virginiana*, applications to basal notches in the dormant season gave better results than other basal applications but for *Q. mohriana* the reverse was true (*R. A. Darrow* and *L. S. Gleason*). Good effects were obtained with basal sprays on *Alnus incana* in July, using various formulations and concentrations, all in diesel oil. Results on *Acer rubrum* were less good, the best formulations being ACP 897–10 at 10,000 p.p.m., Weedone B.K. at 20,000 p.p.m., Dow Esteron 245 at 10,000 p.p.m., and Dow Esteron 44 at 10,000 p.p.m. (*M. W. Day* and *R. E. Dils*). For basal sprays on *Populus tremuloides* 5–10 in. in diam., between March and July, Dow Esteron 245 and Dow Esteron 44 in diesel oil at 8000 p.p.m. were most effective. Frill girdling was much less successful (*M. W. Day*). *Quercus stellata* up to 7 in. in d.b.h. was successfully treated with low volatile esters of 2,4-D or 2,4,5-T at 25 lb. acid in 100 gal. diesel oil. CMU (3-*p*-chlorophenyl-1,1-dimethyl urea) at a concentration of 4·5% by weight in water gave excellent effects on *Q. stellata* and *Q. marilandica* (*W. G. McCully* and *R. A. Darrow*). For freshly cut stumps of various hardwoods up to 2 in. in diameter, basal spraying gave better initial kill and reduction of coppicing than frilling or foliage spraying (*J. M. Nichols*). Basal sprays of 2,4-D and 2,4,5-T in oil were highly effective on mixed woody species near Winnipeg. The addition of 2,4,5-T seems necessary only where resistant species (e.g. *Lantana lentago* and *Rosa* spp.) are present (*L. G. Playfair*). Dormant *Acer spicatum* up to 2 in. in d.b.h. and 12 ft. in height, forming understorey in an Aspen/hardwood forest, was successfully treated with basal sprays of 2–8% solutions of Esteron 245 in No. 1 fuel oil (*E. I. Roe*). Basal spraying in January with the propylene glycol butyl ether esters of 2,4-D, 2,4,5-T and mixtures containing equal amounts of each, in concentrations of 8 or more lb. acid equivalent/100 gal. in fuel oil successfully killed Hawthorn; 80–100% control of *Maclura pomifera* followed basal spraying in January with the propylene glycol butyl ether esters of 2,4-D, 2,4,5-T or mixtures of equal parts at concentrations of 16 lb. (or higher) acid equivalent/100 gal. in fuel oil (*L. L. Coulter*). Results of treatments given some years ago have been checked. Annual counts made on plots of *Corylus cornuta* sprayed with Weedone 48 in 1948 show that despite an increase in the number of stems of all sizes on both control and sprayed plots, there are very few stems over 3 ft. in height on the sprayed plots, and 2 more years will elapse before competition from them interferes seriously with young Pine seedlings in the area (*H. L. Hansen*). *Corylus* spp. sprayed in 1950 with 2,4-D, 2,4,5-T, and mixtures of both, had coppiced in 1951, but coppicing was heavier on plots sprayed in mid-June and in August, than on those sprayed in July. A second-year examination of plots at Cohasset, Minnesota, sprayed in 1950 with 2,4-D and 2,4,5-T confirmed the great tolerance of *Ledum groenlandicum* (*E. I. Roe*). Sprays of 2,4,5-T and mixtures of 2,4-D and 2,4,5-T at 20 gal./acre on *Rosa* spp. in late bloom had given satisfactory control a year later, though no complete eradication was obtained. *Acer negundo* treated when dormant in 1950 with the non-commercial formulation ACP572 (a 2 : 1 mixture of 2,4-D and 2,4,5-T) in oil at concentrations of 1000 and 2000 p.p.m., by spraying from the root collar up to a height of 3 ft., was completely killed. The same species treated with Weedone Brush-killer 32 (a similar preparation) produced foliage with typical 2,4-D twisting and discoloration (*T. K. Pavlychenko*).

Further possibilities of dormant-season control have been demonstrated and the superiority of oils to water in this type of treatment has been confirmed (*C. B. Owens* and *C. J. Willard*; *H. E. Wood et al.*). Basal applications of 4% 2,4,5-T ester and 6% 2,4-D ester in oil completely prevented coppicing of *Diospyros virginiana*, as also did cut-surface applications made in February 1951 with 1–6% acid equivalent solutions of low volatile esters of 2,4,5-T in diesel oil or in 50% or 10% emulsions (*R. A. Darrow* and *W. K. Frey*). In other experiments, however, the same species, given basal and frill treatments from August 1949 onwards, using 2,4-D and 2,4,5-T amine and ester formulations alone and in mixture in diesel oil, had all coppiced where any length of time had elapsed since treatment (*J. E. Gassaway* and *W. C. Elder*).

Much work on brush control is reported. Mixed brush was largely eliminated from a forest planting site in Illinois by 1·5% solution of the oil concentrate of 2,4-D and 2,4,5-T emulsified in water, used as a foliage spray (*R. W. Lorenz*). *Aloysia ligustrina* showed a positive but inconsistent response to foliage sprays of 2,4-D, 2,4,5-T, and combinations of these. In general, the amine formulations offer greater promise than the esters, and the two formulations are more effective combined than alone (*W. G. McCully*). In July 1950 Esteron 44 was applied to the ground under mixed brush in a *Pinus banksiana* stand in Minnesota at concentrations of (1) 2000 p.p.m. and (2) 6000 p.p.m. in water, at 50 gal./acre and (3) foliage sprays with 2000 p.p.m. in water were also used in the same stand. (1) was as effective as (3) but slower in its effect; (2) was less effective than either (1) or (3). In a mixed brush understorey of Hazel sprayed in 1948 with an ethyl ester of 2,4-D, over 95% of the aerial stems of the Hazel were killed, but only light injury was caused to *Rubus strigosus*. By 1951 the removal of the Hazel's competition had caused a great increase in the proportion of *R. strigosus* on the sprayed plots (*H. L. Hansen*). Of several forms of 2,4-D, 2,4,5-T and MCP tested on *Symphoricarpos* spp. the 2,4-D compounds consistently gave the best control (*L. A. Derscheid*). Good and reasonably cheap control of *Quercus ellipsoidalis* in Wisconsin was obtained by using NH_4 sulphamate in horizontal axe cuts near the base of the trees (*J. H. Stoeckeler* and *R. C. Dosen*). On *Q. stellata* and *Q. marilandica* aerial spraying with 1 lb./acre 2,4,5-T butoxy

ethanol ester in a 25% emulsion gave a 90% kill of trees under 6 ft. in height. 2,4,5-T amine applied at ¾ lb./acre was as effective as at 1½ lb./acre and gave a more than 50% kill of *Q. marilandica* under 6 ft. high (*R. A. Darrow* and *W. G. McCully*).

Late summer applications of low volatile esters of 2,4,5-T applied in oil or 50% oil emulsions gave fairly effective control of *Opuntia lindheimeri*. The best control of *O. engelmanni* was obtained with late summer applications of 10,000 p.p.m. 2,4,5-T amine in a 50% emulsion, or of a mixture of 0·6% 2,4,5-T ester and 0·5% dinitro compounds in diesel oil. There were indications that mixtures of 2,4,5-T amine and dinitro compounds in emulsions were more effective than 2,4,5-T alone (*R. A. Darrow, L. Reyes* and *L. S. Gleason*). In the Edwards Plateau region of Texas 100% top kills of *O. engelmanni* were obtained with 2% concentrations of 2,4,5-T propylene glycol butyl ether ester, or a mixture of 0·6% 2,4,5-T isopropyl ester and 0·5% dinitro compounds (*L. S. Gleason* and *R. A. Darrow*).

Results are reported of tests of MCP (2-methyl-4-chlorophenoxyacetic acid) and CMU on several species. CMU applied in April (plants dormant) and May (plants in leaf) to *Berberis canadensis* as a powder in water suspension at rates of ½ lb./sq. rod gave good results. When soil round *B. canadensis* bushes was treated with ¼ or ½ lb. CMU as a dry powder, the bushes appeared to die, though the action was slow and results are not yet definitely established. In Pennsylvania the butoxyl ethyl ester of MCP proved more toxic to *B. canadensis* than either 2,4-D or 2,4,5-T when oil solutions (12 and 24 lb. acid equivalent/100 gal.) were applied either in the dormant or the foliage stages (*L. W. Melander, M. Campbell* and *W. Watson*). Reactions of MCP in comparison with 2,4-D or 2,4,5-T on a large number of species have been tested by the Agricultural Division of the American Paint Co.; the final ratings are to be made in 1952 (*T. K. Pavlychenko*).

407. Beatty, R. H. **Possibilities of dormant basal sprays.** *Suppl. Proc. 5th Ntheast. Weed Control Conf.* 1951 (71–2). O.R.E.

Oil/water mixtures (10 gal. oil/90 gal. water) proved a more effective carrier of the esters and acids of 2,4,5-T or mixtures of 2,4-D and 2,4,5-T at low concentrations, than water alone, and were probably equal to diesel oil. Concentrations of 10–20 lb. acid in 100 gal. mixture seemed sufficient. *Acer rubrum* is more susceptible to dormant basal treatment than Ash or Black Gum (*Nyssa sylvatica*). Treatments should be given near the time when buds begin to swell.

408. Day, M. W. **Controlling Alder [*Alnus incana*] with basal stem sprays [of 2,4,5-T].** *Quart. Bull. Mich. agric. Exp. Sta.* 34 (4), 1952 (354–6). 3 refs.

Cf. *For. Abstr.* 13 (No. 1307).

409. Fisher, C. E., and Young, D. W. **The effect of herbicide droplet size on the control of Mesquite when applied by airplane equipment.** *Proc. 7th ann. Nth. Cent. Weed Control Conf.* 1950 (84–6). O.R.E.

Experiments with various solutions of 2,4-D and 2,4,5-T showed that those delivered in medium to coarse droplets were quite as effective as those delivered in fine droplets.

410. Blair, B. O., and Fuller, W. H. **Translocation of 2,4-dichloro-5-iodophenoxyacetic acid in Velvet Mesquite seedlings.** *Bot. Gaz.* 113 (3), 1952 (368–72). 3 refs. O.B.D.

The radio-active herbicide 2,4-dichloro-5-iodophenoxyacetic acid (2,4-DI^{131}) was sprayed on foliage of *Prosopis juliflora* var. *velutina* seedlings, with and without adjuvants (co-solvents and surface-active agents). Results from Geiger-count analyses show that, 96 hours after spraying, less than 3% of the deposited radio-active materials had moved from the treated seedling tops to more basal tissue. Addition of adjuvants at a rate of 1% by volume did not produce greater total translocation of the herbicide, but caused translocation of relatively greater amounts of the herbicide to root and hypocotyl than to the stem. It also substantially increased the degree of acute local toxicity in the tissue sprayed. This extremely limited movement may be the reason for erratic results when 2,4-D and other phenoxy compounds are sprayed as herbicides on mature *P. juliflora* var. *velutina*.

411. Grigsby, B. H. **Effects of herbicides on hydrocyanic acid content of *Prunus serotina* Ehrh. leaves.** *Abstr.* in *Res. Rep. 8th ann. Nth. Cent. Weed Control Conf.* 1951 (178–9).

Wild trees were sprayed with 2,4-D, 2,4,5-T, a mixture of equal parts of these compounds, and with NH_4 sulphamate. Samples of the leaves were then taken at different intervals after spraying. The HCN content was greatest at the time of spraying and decreased steadily until the leaves became yellow and dry. All these samples had less HCN than was found in untreated samples collected at the same time. The results indicate that wild Cherry did not become more toxic to livestock when sprayed with the herbicides used in this experiment.

412. Bramble, W. C., and Worley, D. P. **Control of Black Locust [*Robinia pseudoacacia*] with chemical spray.** *Progr. Rep. Pa. agric. Exp. Sta.* No. 72, 1952. pp. 5.

Tests of chemical sprays were made on a thicket of *Robinia pseudoacacia* 12 ft. high. After felling the thicket, the stumps were immediately sprayed, and in the two following years foliage sprays were applied to the sucker growth that arose. This gave complete eradication when using aqueous sprays of the following: (1) 30% by weight of Ammate, (2) 0·78% by volume (3500 p.p.m. of acid) of Esteron 44 (2,4-D ester), or (3) 0·78% by volume (3700 p.p.m. of acid) of Esteron 245 (2,4,5-T ester). When the root suckers were allowed to grow and develop for a year, the established sucker-growth was not eradicated by two foliage sprays given in the 2nd and 3rd year respectively.

413. Fransson, P. Bekämpning av björk i Norrland medelst hormonderivat. **[Control of Birch in N. Sweden with hormone derivatives.]** *Medd. SkogsforsknInst., Stockh.* 41 (1), 1952. pp. 20. 8 refs. [Sw.e.] Price *Kr.*1.

[Cf. *For. Abstr.* 10 (No. 2228).] As a result of experiments during 1947 and 1948 using Agroxon J, Weedone, WNM & Wormosan, recommendations for treatment are made. Birch stumps with coppice shoots should be killed by spraying the leaves with an aqueous solution of 0·3–0·4% MCPA or 0·2–0·4% 2,4-D, between full leaf development and 1 August. All the leaves, especially those at the top of the shoots, must be sprayed. The shoots will be killed in the first year, and the roots will be affected in the following year. If Pine and Spruce of less than 2 years old are growing among the Birch, spraying should be postponed for some years. Older Pine and Spruce (3–10 years) are less sensitive and MCPA, but not 2,4-D, may be used, so long as care is taken not to direct the spray on to them. Pine and Spruce more than 10 years old are not likely to be seriously damaged and 2,4-D, which is more effective against Birch, may be used. Trees may be treated by injecting 2,4-D solution or powder into a notch cut in the trunk. An average minimum dose of 1·5 g. 2,4-D will generally kill trees with butt diameters up to 4 in.; for larger trees 2-4 notches can be made. The trees usually die within 2 years and can be felled without danger of coppicing. Treated trees were as easy to bark as untreated trees and there was no difference in the pulping qualities of the wood or in the bleaching qualities of the pulp.

414. HUBERT, F. P., MCCUBBIN, W. A., and WHEELER, W. H. **2,4-D injury to common Horse-chestnut causing virus-like symptoms.** *Plant Dis. Reptr.* 36 (2), 1952 (65). A.P.B.

Die-back of terminals, spindly new shoots, and general chlorosis in two *Aesculus hippocastanum* trees at the U.S. Naval Observatory are thought to be due to accidental spraying with 2,4-D. The more completely affected tree has died, but the other recovered.

442. *Parasitic (Higher) Plants. Climbers and Epiphytes*

415. NAYAR, B. K., and NAYAR, P. N. **On the range of hosts of *Cassytha filiformis* Linn.** *Sci. & Cult.* 17 (9), 1952 (383–4). E.M.B.

Lists 28 species, mainly trees and shrubs, found as hosts in the Veli Hills, Travancore.

416. KACHROO, P. **On *Cuscuta reflexa* Roxb. in the Khasi Hills.** *Sci. & Cult.* 16 (9), 1951 (431). 2 refs. E.M.B.

The list of host plants on which *C. reflexa* was found to be parasitic in the Khasi hills includes *Quercus fenestrata, Symplòcos crataegoides, Leucosceptrum canum, Gaultheria* spp. and *Pinus khasya.*

417. SHERIAR, K. C. **Parasitism of *Cuscuta reflexa* Roxb. and *Loranthus longiflorus* Desr.** *Sci. & Cult.* 17 (5), 1951 (218–9). 3 refs. E.M.B.

Host plants near Bombay for *C. reflexa* were *Zizyphus jujuba, Lawsonia alba, Jasminum pubescens, Carissa carandas* and *Clerodendron inerme*; and for *L. longiflorus—Grewia pilosa, Eugenia jambolana* and *Morus alba.*

418. GREENHAM, C. G. FIELDING, J. M., HAMILTON, C. D., and NICHOLSON, D. I. **A progress note on mistletoe control investigations.** *Aust. For.* 15 (1), 1951 [1952] (62–4). 4 refs.

Preliminary results of experiments at Canberra on Eucalypts parasitized by *Loranthus* spp. indicate that trunk injection with 2,4-D is a promising method for the control of mistletoe. The dose varies with the season, and possibly with the site and Eucalypt species. Investigations are continuing, particularly with a view to reducing the cost of application. Some evidence has already been obtained that it is not necessary to apply 2,4-D to uniformly spaced holes; this may be due in part to a slow interchange of 2,4-D between host and parasite. Injection of trees with $CuSO_4$ (dose proportional to $(d.b.h.)^2$) was the most successful of the treatments with inorganic substances, but killed only ca. 50% of the mistletoe. [Cf. *For. Abstr.* 11 (No. 1451).]

419. MCKEE, H. S. **Root parasites in Loranthaceae.** *Nature, Lond.* 170 (4314), 1952 (40). 6 refs.

Atkinsonia ligustrina, a terrestrial species, has now been shown to be a root parasite on several hosts including *Acacia intertexta* and *Leptospermum attenuatum.*

420. HOME, SIR J. M. **Ivy as a forest weed.** *Scot. For.* 6 (3), 1952 (86–7).

Ivy growing in a mat on the ground can be controlled by spreading 6–8 in. of hardwood sawdust over the area. Resinous coniferous sawdust is not suitable.

443. *Fungi and Bacteria*

See also Nos. 103–8.

421. BAXTER, D. V. **Pathology in forest practice.** John Wiley & Sons, Inc., New York, and Chapman & Hall, Ltd., London. 2nd ed., 1952. pp. xiii+601. 709 refs. Price £3 ($7·50).

A textbook based on American conditions and literature and covering disease in nurseries, plantations and forests, and decay, moulds and stains of timber. The first edition appeared in 1943.

443.2. Diseases of Seed and Seedlings; Damping Off etc.

See also No. 452.

422. CIFERRI, R. La 'mummificazione' delle castagne da *Phomopsis endogena* (Speg.) nobis, n. comb. **[The 'mummification' of chestnuts by *P. endogena* n. comb.]** *Notiz. Malatt. Piante* No. 8, 1950 (36–7, 56). 5 refs. [It.] I.M.I.

423. ŠTRAUH, S. A. K biologii griba *Phomopsis quercella*, vyzyvajuščego zabolevanie želudeĭ. **[The biology of *P. quercella*, a fungus causing disease of acorns.]** *Dokl. Akad. Nauk SSSR* 81 (1), 1951 (109–12). 2 refs. [Russ.] A.P.B.

The most widespread fungus responsible for disease of acorns in Russia was identified in 1950 as *P. quercella.* In a search for the source of infection, single-spore cultures were made of an ascomycete found on dead Oak branches. These resembled cultures from pycnospores of *P. quercella* and produced the latter's characteristic pycnidia and pycnospores. In comparative cultures of the two forms the ascospores germinated faster than the

pycnospores, but the resulting mycelia and their behaviour were identical, and it is concluded that the ascomycete, which is described and identified as *Diaporthe insularis*, is the alternate stage of *P. quercella*. *D. insularis* grew best in culture on young bark and on bast from an old Oak, but also succeeded on the bark and young wood of branches; on sapwood and heartwood from the stem, on 3% tannin solution, and on an aqueous extract of acorns in glass wool, it grew more feebly; and on starch, old bark, and filter paper there was practically no growth. The rôle of the fungus in the tree is unknown. Tests showed that acorns already contain the fungus while still on the tree and that it is to be found inside the pericarp. With ordinary collection and storage practices, up to 16% or more of the acorns have cotyledons infected, chiefly by *P. quercella*, within 1–1½ months. Infection of the pericarp only spreads to the cotyledons when conditions favour the fungus, mechanical injury to the cotyledon tissues being an important factor. The most dangerous period is that immediately following the fall of the acorns; no spread of infection from diseased to sound acorns was observed in storage, since the fungus does not form a luxuriant aerial mycelium and does not produce spores during the storage period. Control measures must therefore be early: acorns should be collected and treated with a fungicide (it is suggested that formalin solution might well be tried) as soon as possible after their fall.

424. Gregory, K. F., Allen, O. N., Riker, A. J., and Peterson, W. H. **Antibiotics as agents for the control of certain damping-off fungi.** *Amer. J. Bot.* 39 (6), 1952 (405–15). 28 refs. O.B.D.

Reports the results of tests of the action of a number of antibiotics and antagonistic micro-organisms against species of *Pythium*, *Fusarium* and *Rhizobium*.

425. Itô, K., Shibukawa, K., and Kobayashi, T. **Etiological and pathological studies on the needle blight of *Cryptomeria japonica*. 1. Morphology and pathogenicity of the fungi inhabiting the blighted needles.** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 52, 1952 (79–158). 71 refs. [Jap.e.]

Of 40 species isolated and considered to be pathogenic, *Phoma cryptomeriae*, *Cercospora cryptomeriae*, *Pestalotia shiraiana* and *Mycosphaerella cryptomeriae* were most frequently collected. *P. cryptomeriae*, *P. shiraiana*, *Sphaeropsis cryptomeriae* and *M. cryptomeriae* were found on seedlings, stocks, cuttings and adult trees, *C. cryptomeriaecola*, *Physalospora cryptomeriae*, *Leptosphaerulina japonica* and *Moltisia cryptomeriae* only on adult trees and *C. cryptomeriae* on younger trees especially 1- to 4-year-old seedlings. In experiments on 2-year seedlings pathogenicity of *C. cryptomeriae* was high and that of *P. cryptomeriae* was low; *C. cryptomeriae* is considered the most dangerous of the fungi causing needle blight in *Cryptomeria* seedlings. *P. cryptomeriae*, *M. cryptomeriae*, *Pestalotia cryptomeriae* and *P. aomoriensis* enter only through damaged leaves. *Pestalotia shiraiana*, *Macrophoma sugi* and *Stagonospora cryptomeriae* attack both damaged and very young healthy leaves, but do only slight damge. *From authors' summary.*

426. Nohara, Y., and Zinno, Y. **Researches on the prevention of the needle blight of Sugi (*Cryptomeria japonica*).** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 52, 1952 (159–80). [Jap.e.]

Bordeaux mixture was the most effective of 5 fungicides tested against *Cercospora cryptomeriae*. The most important seasons for spraying are late June to July, and late August to early September. Low concentrations of Bordeaux mixture are effective. No decisive results have been obtained on the effect of manuring on damage by the disease. *From authors' summary.*

427. Boyce, J. S., Jr. ***Scirrhia acicola*, a cause of Loblolly Pine needle browning.** *Abstr.* in *Phytopathology* 42 (5), 1952 (282).

Field observations in the Carolinas and Georgia in 1949 and 1950 indicated that *S. acicola* can cause extensive needle die-back on *Pinus taeda*, as well as on *P. palustris* [cf. *For. Abstr.* 1 (pp. 82, 242); 3 (pp. 75–6); 6 (p. 191)]. Proof of pathogenicity to *P. taeda* was obtained by spraying seedlings with water suspensions of conidia derived from a single-spore culture. The Pines were kept in iceless refrigerators for several days after spraying. Inoculations were begun in February 1951 in the greenhouse and were made periodically until the end of August. Needle die-back, with the production of acervuli, was observed 2 to 5 months after inoculation.

428. Boyce, J. S., Jr. **Loblolly Pine needle blight caused by the brown-spot fungus [*Scirrhia acicola*].** *Res. Note Stheast. For. Exp. Sta.* No. 11, 1952. pp. 1.

429. Müller-Kögler, E., Sy, M., and Thielicke, W. Über Versuche zur Bekämpfung des Eichenmehltaus. **[Experiments in the control of *Microsphaera quercina*.]** *Forst u. Holz* 7 (12), 1952 (159–62). [G.]

Trials were made in the Walsrode forest district with 'Cosan', a commercial preparation, both in the form of a liquid colloidal sulphur, and as a wettable sulphur. The best treatment appears to be 4 sprayings (about the middle of June, July, August and September). Sulphur dust was inferior to the sprays. A wetting agent improved the effect of the sprays. Spraying must be thorough, so that both the upper and the under sides of the leaves are dripping wet. If the attack is slight a 0·2% spray is adequate. With severe attacks a concentration of 0·4% is necessary.

443.3. Diseases of Older Stages

Stem, Butt and Root Rots; Root Diseases

430. Henriksen, H. A. Røntgenfotografering som diagnostisk hjælpemiddel ved undersøgelse af træer. **[X-ray photography as an aid to diagnosis in investigating trees.]** *Dansk Skovforen. Tidsskr.* 36 (10), 1951 (515–20). [Dan.]

Experiments were made in a plantation of Scots Pine attacked by *Fomes annosus*. X-ray photographs were taken from a distance of 1 m. of logs

from freshly felled trees, to show the longitudinal section of the tree. On the photographs the area of disease was dark in colour and the annual rings of diseased trees were visible, while the annual rings of healthy trees were barely, if at all, visible. Severe attacks could be easily distinguished, but it was difficult to distinguish between slight and fairly heavy attacks. The visibility of the annual rings on photographs of severely damaged trees is attributed to a lowered moisture content, and this was confirmed by determinations of moisture content in increment cores. Even a slight degree of *Fomes* attack reduced the m.c. considerably. As the effect in the X-ray photos appears to be due to reduced m.c., its presence is not necessarily an indication of *F. annosus* but merely of there being something wrong with the tree. Costs at present are likely to be at least Kr.10–15 per photograph, and the method could only be used when it is, for some reason, necessary to determine the degree of attack without damaging the tree. [Cf. *For. Abstr.* 14 (No. 776).]

431. Foster, R. E., and Ziller, W. G. **Decay of Amabilis Fir**. *Rep. For. Insect Dis. Surv. Can. 1951*, 1952 (148–9).

Data from a survey in British Columbia indicate that decay of *Abies amabilis* gives an average cull factor of 30%. *Echinodontium tinctorium* was responsible for 55% and *Fomes pini* for 17% of total decay.

432. Browne, J. E. **Decay in Engelmann Spruce and Alpine Fir [*Abies lasiocarpa*] in the Bolean Lake area, British Columbia**. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 8 (3), 1952 (4).

In Spruce of merchantable size, 60% of the total loss was due to *Fomes pini*, in Fir 39% was due to *Echinodontium tinctorium*. Trunk rots associated with *Stereum sanguinolentum* and *Fomes pinicola* were of secondary importance in both species.

433. Redmond, D. R. **Decay in Red Spruce [*Picea rubens*]**. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 8 (3), 1952 (1).

Analysis of 676 living Red Spruce trees in Nova Scotia on 12 plots totalling 2·9 acres showed that 7·6% of the volume of merchantable timber/acre was cull. No trees under 80 years old contained measurable decay and at 160 years 18% contained decay. Amount of decay shows a strong correlation with age and diameter. The following formulae are presented to show these correlations: % of decay (cu. ft.) of gross merchantable volume = (1) 0·086 (age in years) − 0·145 (d.b.h. o.b.) − 5·45, or (2) 0·075 (age in years) − 5·27, or (3) 0·361 (d.b.h. o.b.) + 1·70. A total of 12 wood-destroying fungi were found to be associated with decay in living Red Spruce; *Fomes pini* was the most important source of decay throughout the tree.

434. Denyer, W. B. G. **Red stain in Lodgepole Pine in Alberta**. *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 8 (2), 1952 (3–4).

Examination of a number of poles with a red stain in their trunks showed that this was caused sometimes by *Fomes pini* and sometimes by *Sterum pini*.

435. Rudd Jones, D. **Heart-rots of Cypresses**. *Rep. E. Afr. Agric. For. Res. Organ. 1951*, 1952 (35).

Polystictus versicolor has been found causing a profound white rot of *Cupressus macrocarpa* in Kenya, in contrast to its behaviour in Europe, where it occurs normally as a saprophyte. Infection takes place either through pruning scars or through so-called 'stem cracks'. These are very deep longitudinal cracks which occur in many planting districts but appear to be most serious where the rains are immediately followed by a very dry period and especially where trees are growing under exposed conditions. The cracks close up with the onset of the rains and are occluded, so that it is difficult to determine whether a tree is affected.

436. Thacker, D. G., and Good, H. M. **The composition of air in trunks of Sugar Maple in relation to decay**. *Canad. J. Bot.* 30 (4), 1952 (475–85 + 3 photos). 16 refs. P.R.

The internal air of Maple trunks was found to vary considerably in composition, particularly in decaying trees. In all cases CO_2 occurred in much larger, and O_2 in smaller amounts than in the atmosphere. CO_2 content was highest in the summer and lowest in midwinter, O_2 varying reciprocally. Diurnal variations were also noted. Growth of Maple rot fungi on malt agar was favoured by CO_2 in concentrations found in living trees. In several cases, optimum concentrations were of the order of 10%, growth being approximately double that in CO_2-free air. O_2 had little effect within the range of concentrations occurring in trees. It is concluded that aeration is probably not an important factor in the development of decay, poor aeration tending to be stimulating rather than inhibiting. *Authors' summary.*

437. Grente, J. Le *Phytophthora cinnamomi* parasite du châtaignier en France. [***P. cinnamomi* on Chestnut in France.**] *C.R. Acad. Sci., Paris* 234 (22), 1952 (2226–8). [F.] O.R.S.

A brief account of the distribution of *P. cinnamomi* and of *P. cambivora* in France, and of methods of distinguishing them.

438. **Clove research**. *Rep. E. Afr. Agric. For. Res. Organ. 1951*, 1952 (43–4).

All attempts to produce positive evidence, in place of the strong circumstantial evidence that supported a virus hypothesis for the origin of sudden-death disease of Cloves, having so far been unsuccessful [cf. *For. Abstr.* 13 (No. 1413)], a re-examination was made of the possibility that a primary fungal pathogen might be concerned. This has yielded rapid and encouraging results: in every one of the thousands of sudden-death casualties examined, a fungus was found, and always the same one—a new species of *Valsa*. In the early stages of the disease the fungus can be found only with difficulty in the more distal portions of the root system; later it can be found in the larger roots, and after the death of the tree, ramifies throughout the trunk and branches, producing a characteristic yellow stain. Some 3 months later fructifications appear. Conclusive proof of its pathogenicity has been obtained, but there are indications that only mature trees can be attacked. Die-back of Cloves

has been shown to be caused by a fungal wound parasite, a new species of *Cryptosporella*, which also causes the death of young trees in the sudden-death manner.

Wilts, Diebacks etc.

See Nos. 70–1, 438, 441.

Cankers, Stem Rusts etc.

See also Nos. 105–6.

439. GRASSO, V. Conifere suscettibili ed immuni al *Coryneum cardinale* Wag. [**Coniferous species susceptible and immune to *C. cardinale***.] *Ital. for. mont.* 7 (3), 1952 (148–9 + 7 photos). [It.it.]

Experimental inoculation with *C. cardinale* showed that *Cupressus macrocarpa*, *C. arizonica* and *C. sempervirens*, were very susceptible; *Thuja plicata* and *T. orientalis* more resistant; and *Libocedrus decurrens*, *Chamaecyparis lawsoniana*, and *Pseudotsuga taxifolia* apparently immune. [Cf. *For. Abstr.* 13 (No. 436).]

440. RUDD JONES, D. **Canker disease of Cypresses caused by *Monochaetia unicornis*.** *Rep. E. Afr. Agric. For. Res. Organ. 1951*, 1952 (31–5).

A survey of sample plots in unpruned 3-year-old, strip-by-strip plantations of *Cupressus macrocarpa* and *C. lusitanica* showed that 90% of diseased trees had been infected in branch crotches and that recovery % (i.e. occluding of cankers) was 6 for *C. macrocarpa* and 10·5 for *C. lusitanica*. In once-pruned, pure plantations of the two species 5 and 6 years old, 44% of the trees had been infected in branch crotches and 66% on stems. The % recovery was 32·5 for *C. macrocarpa* and 86·5 for *C. lusitanica*.

Collections of the fungus have been made from the native Pencil Cedar (*Juniperus procera*) and these included a new strain (strain D) that produces a mild lesion on *J. procera* but is non-pathogenic to all *Cupressus* species tested. The presence of this strain on an indigenous conifer strengthens the theory of the evolution of a serious parasite from a comparatively harmless fungus.

Using a standard wound through the bark, followed by the placing of a standard agar inoculum over the wound, the resistance of 5 *Cupressus* species was investigated. The most rapid longitudinal extension of cankers was in *C. benthami*, followed by *C. macrocarpa*, *C. arizonica*, *C. lusitanica*, and *C. torulosa*, in that order. If inoculation was delayed for 4 days after wounding, the order of *C. arizonica* and *C. lusitanica* was reversed. With further delay in inoculation, the number of successful inoculations fell, *C. macrocarpa* being the most frequently infected.

Experiments were made on the growth of the fungus on bark agars of the 5 *Cupressus* species, *J. procera* and *Podocarpus gracilior*, another indigenous conifer. Growth was best on *J. procera*, slightly less on the Cypresses, and very limited and sparse on *P. gracilior* bark agars.

441. ZYCHA, H. Die *Phomopsis*-Krankheit von Douglasie und Japanlärche. [***Phomopsis* disease of Douglas Fir and Japanese Larch.**] *Forstwiss. Cbl.* 71 (3/4), 1952 (65–79). 23 refs. [G.g.]

Attack by *Phomopsis pseudotsugae*, a wound parasite, is more common in Germany than is generally supposed, especially since the wider introduction of *Pseudotsuga taxifolia* and *Larix leptolepis*, which are its primary hosts. On young trees the fungus causes death of the leaders; on trees 15–30 years old it causes local bark injuries. It lives only for one year, however, and therefore the bark damage is not chronic but heals over in the same way as a mechanical injury. In young trees the fungus probably follows frost damage, and therefore any measures to guard against frost injury will also prevent attack by *P. pseudotsugae*. In older trees infection enters through bark injuries, and since it usually takes place during the cold weather, between autumn and spring, pruning should be done in summer.

442. SPAULDING, P. **A stem rust of *Pinus roxburghii* in India potentially dangerous to the United States.** *Plant Dis. Reptr.* 36 (4), 1952 (159–61). 14 refs. A.P.B.

[Cf. *For. Abstr.* 6 (191).] Reviews present knowledge of the occurrence of *Cronartium himalayense* on *P. roxburghii* [*P. longifolia*] in India, and discusses its potential danger to Pines in the U.S.A.

443. RUSDEN, P. L. **Blister rust damage at Waterford, Vermont.** *J. For.* 50 (7), 1952 (545–51). 6 refs.

Data from observations made for 20 years on a stand of merchantable *Pinus strobus* infected with blister rust are analysed. The rust is not a reliable thinning agent, for at the end of the period 73·4% of the crop trees were dead or dying. Trees of all sizes are killed, but the larger trees are killed more slowly. The financial loss is assessed and discussed.

444. MOLNAR, A. C. **Canker damage to Lodgepole Pine.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 8 (2), 1952 (4).

Severe canker damage to a Lodgepole Pine stand in British Columbia was found to be due to *Cronartium stalactiforme* and *Atropellis* sp. The cankers are described. Secondary attack by rot fungi, insects and rodents had occurred in many cases.

445. WALTER, J. M., REX, E. G., and SCHREIBER, R. **The rate of progress and destructiveness of canker stain of Plane trees.** *Phytopathology* 42 (5), 1952 (236–9). 9 refs.

A study of the progress of *Endoconidiophora fimbriata* f. *platani* on *Platanus acerifolia* in a street plantation in New Jersey. The disease, which is almost always transmitted by man, was probably introduced by pruning in 1926. A table is presented showing the course of the disease over a period of more than 9 years. By May, 1949, 87·1% of the trees had been lost.

446. DARPOUX, H. Le chancre du châtaignier causé par l'*Endothia parasitica*. [**Chestnut canker caused by *E. parasitica***]. *Revue Technique de la Protection des Végétaux, Paris* 1 (4), 1948 (307–30 + 4 plates). [F.] H.S.B.

Deals with symptoms of the disease, its distribution in Italy and Spain, its importance from an economic point of view, the characteristics of the

fungus, method of dissemination, hosts, and control methods, with particular reference to French control problems.

447. Mikuletić, V. *Endothia parasitica* A. u Sloveniji. [***E. parasitica* in Slovenia.**] *Šum. List* 76 (5/6), 1952 (178–9). [Croat.]

Chestnut blight in Slovenia, observed since 1940, was first attributed to *Phytophthora cambivora*, and it was not until 1950 that *E. parasitica* was found to be the causal fungus. Out of the Chestnut [*Castanea sativa*] area of 2500 ha., 9·07% is attacked by *E. parasitica*, the age of trees attacked varying from 1 to 150 years, and the altitude from 70 to 600 m.

448. Orsenigo, M., and Boncompagni, T. Nota preliminare sui trattamenti antisporulanti nell'eradicazione del cancro del castagno da *Endothia parasitica*. [**A preliminary note on treatments for the prevention of spore formation in the control of *Endothia parasitica* canker of Chestnut.**] *Notiz. Malatt. Piante* No. 10, 1950 (52–7). 15 refs. [It.] I.M.I.

As one of the chief drawbacks to the control of *Endothia parasitica* by eradication or tree surgery is that either method favours the dispersal of viable pycnidiospores, the authors carried out an experiment to ascertain whether pycnidiospore formation could be arrested. Chestnut trees in a severely affected area at Mompiano, Brescia, were sprayed with several fungicides at different concentrations: (1) DNC in white oils at 8 and 12%; (2) DNC emulsion at 8 and 12%; (3) salts of oxyquinoline in white oils at 0·5%; (4) phosphoric esters in white oils at 0·3%; (5) white oil; (6) carbolineum. Five days later pieces of treated bark were removed and placed in a damp chamber for 13 days, when it was found that of the 20 trees given treatments (1), only 4 formed fresh pycnidia, compared with 4 out of 5 of untreated controls and 54 out of 61 for the other treatments. Germination of pycnidiospores on potato agar at 24° C. after treatments (1) showed that 71·4 and 66·6% respectively were alive as compared with 100% for controls and 91·6–100% for other treatments. Further work is in progress.

449. Graves, A. H. **A method of controlling the Chestnut blight on partially resistant species and hybrids of *Castanea*.** *41st Rep. Nth. Nut Growers Ass.* 1950 (149–51).

Describes a method used successfully on Chestnut plantations at the Connecticut Agricultural Experiment Station. When Chestnuts are attacked by *Endothia parasitica*, suckers arise below the lesion, and if the lesion is at or near the base of the tree, as often happens, it is a simple matter to cut out the diseased bark of the lesion with a sharp knife, paint over the wound, and graft the tip of one or more of these suckers into the healthy bark above the lesion. The method of inarching is described in detail and illustrated. Scions or inarches grafted in 1937 were by 1950 6 in. in diameter at ground level and constituted the main tree. The purpose of the inarching is to restore communication between leaves and roots which the diseased bark interrupts. The method is not suited to the American Chestnut, since the fungus advances so rapidly in this species that girdling is often complete before the scions can take hold.

450. Clapper, R. B. **Relative blight resistance of some Chestnut species and hybrids.** *J. For.* 50 (6), 1952 (453–5). 3 refs.

Approximately 1400 trees of three Chestnut (*Castanea*) species and numerous types of hybrids ranging in age from 5 to 13 years were given more than 2200 inoculations with the Chestnut blight fungus, *Endothia parasitica*, in 1943 at the federal test plots near Glenn Dale, Md. Data were taken 2 months, 4 months, 10 months, 2 years, and 4 years after inoculation to obtain information on the % of trees infected, average area of cankers, and % of trees killed.

First-generation trees obtained by crossing a selection of *mollissima* with *dentata* show promise for use as timber trees. Their resistance to blight appears to be sufficient to justify using them for extensive experimental forest planting whenever a practicable method is developed to increase the stock on a large scale. The backcross generation obtained by crossing the F_1 with *mollissima* shows a resistance to blight almost equal to that of the *mollissima* parent. However, the growth rate and form of the backcross-generation trees also resemble these characteristics in *mollissima* and hence they are considered less satisfactory than the superior F_1 trees for use in forest plantings.

From an analysis of the frequency distribution of canker areas in this backcross generation, the hypothesis is advanced that two pairs of genes control resistance to blight. *Author's summary.*

451. Gravatt, G. F. **Diseases of the Chestnut and Poplar in Europe.** O.E.E.C., Paris. 1952. pp. 26.

Reports of a mission to Europe by an American pathologist. Part 1 reviews the spread of Chestnut blight [*Endothia parasitica*] on Chestnut in Europe, the susceptibility of European Oaks to the disease, the means of spread, and the possibility of breeding disease-resistant Chestnuts. Part 2 discusses the danger of spreading diseases on Poplar cuttings sent from one country to another.

452. Baldacci, E., Ciferri, R., Orsenigo, M., and Scaramuzzi, G. Osservazioni sul 'cancro batterico' del pioppo in Lombardia. [**Observations on bacterial canker of Poplar in Italy.**] *Notiz. Malatt. Piante* No. 9, 1950 (15–25 + 1 plate). 10 refs. [It.] I.M.I.

In the spring of 1949 diseased cuttings and seedlings of 'Canadian' Poplar from a nursery near Pavia, and diseased material from 2-year-old trees grown elsewhere from cuttings from the same nursery, were received at the Pathological Laboratory at Pavia. They exhibited pathological features of three kinds: (1) collar necrosis of 1-year-old seedlings, with vertical cracks in the bark extending into the wood; (2) the bark of cuttings was blackened, usually at both ends but often extending over the whole cutting, and the discoloration extended into the wood; (3) irregular swellings formed on the stems of seedlings 1–2 years old at points where twigs had been removed or other small wounds inflicted.

Plants of group (1) often reacted by putting out buds above the diseased zone. It seems that the disease appeared and spread rapidly through the nursery in the space of a month and that its onset coincided with frequent watering of the nursery beds and with a very wet May. The hybrid Poplar 'A.M.' was particularly susceptible.

Of the cuttings displaying symptoms of class (2), hybrids 262 and 455 from Casale were affected as well as hybrid A.M. A bacterium forming white or yellowish-white colonies was isolated from infected material and 1-year-old Poplar seedlings were inoculated with it. There was little reaction in lignified stems, but in young branches inoculations gave rise to irregular swellings. The bacterium, which has not been identified, is readily cultured on potato agar, but it has not so far been found possible to subculture it. The possible identity of the disease with cankers of adult Poplars described in the literature is discussed, and it is concluded that it probably corresponds with the disease described by Voglino-Servazzi in Piedmont, by Régnier in France, and by Koning in Holland.

453. Sarasola, A. A., and Magi, A. O. Algunos factores ambientales en correlación con la cancrosis de los álamos (*Mycosphaerella populorum* Thomp.). **[Some environmental factors related to *Mycosphaerella* Poplar canker.]** *Phyton, Buenos Aires* 1 (1), 1951 (42–5). 1 ref. [Span.e.] C.G.B.

Variations in intensity of attack by *M. populorum* on the hybrid Poplar 'A.M.' were noted in different places in Buenos Aires province. The following classification of degree of attack was drawn up and correlated with various factors: (0) without visible cankers on stem, branch or twigs; leaves not attacked; (1) with visible cankers on the upper half of the stem, branches and twigs; leaves affected; (2) as (1) with the addition of cankers in the form of slight fissures on the lower half of the stem; leaves affected; (3) as (1) with cankers in process of healing on the lower half of the stem; leaves affected; (4) as (1) with unhealed cankers on the lower half of the stem; leaves affected.

Soil analyses show a distinct relationship between soil pH and degree of attack, giving a correlation coefficient of $-0{\cdot}664 \pm 0{\cdot}077$. Intensity of attack also seems to be greater in areas having heavy rainfall in spring and early summer. After a wet spring and summer, early leaf-fall with consequent weakening of the trees was observed. [Cf. *For. Abstr.* 6 (46).]

Foliage Diseases

See also Nos. 425–9, 488.

454. Ciferri, R. Nomenclatura del fungo che causa la 'defogliazione primaverile' dei pioppi. **[Nomenclature of the fungus causing spring defoliation of Poplars.]** *Notiz. Malatt. Piante* No. 14, 1951 (88, 103). 4 refs. [It.e.] I.M.I.

The pathogen is renamed *Endostigma populina* (Vuill.) n. comb. (= *Didymosphaeria populina* Vuill.; = *Venturia populina* Fabr.). Synonyms of the conidial stage, *Pollaccia elegans*, are probably *Stigmina populi* and *Septogloeum rhopaloideum*.

455. Hepting, G. H. **Leaf blister of Oak controlled by spraying.** *Arborist's News, Wooster* 16 (6), 1951 (53–5). L.S.

In a small-scale experiment on two Scarlet and one Black Oak in 1949, spraying with Puratized Agricultural Spray (a phenyl mercury ammonium lactate) or with a fixed Cu fungicide, after the leaves were out to a length of ½–1 in., failed to control damage by *Taphrina coerulescens*. Dormant spraying in February and March 1950 controlled the disease almost completely. The spray formula was: 1·5 pints Puratized Agricultural Spray and 3 lb. ziram (zerlate) mixed together in 100 gal. water, applied late in February and again early in March as the buds were swelling but well before they burst.

444. VIRUS DISEASES

See No. 61.

45. DAMAGE BY ANIMALS

451. *Mammals*

See also Nos. 48–55, 172, 239–40, 268, 880.

456. Bever, D. N. **Wheat treated with thallium sulphate for use as rodent bait.** *Res. Notes Ore. Bd. For.* No. 1 [1950?]. pp. 7.

Experiments showed that wheat absorbs the poison adequately and is acceptable to mice, and can therefor be used instead of expensive Douglas-Fir seed as rodent bait.

457. Lavender, D. P. **Field and laboratory tests of some forest rodent control preparations.** *Res. Notes Ore. Bd. For.* No. 6, 1952. pp. 14 + 8 photos + 2 gphs. + 2 tbls. + 1 map.

Field experiments had indicated that soaked sodium-fluoroacetate ('1080') and thallous-sulphate baits were the most effective rodenticides. In this experiment these two poisons were further tested to determine the effect of weathering on their lethal properties and palatability. The data obtained were too erratic to afford a basis for definite conclusions, but did not indicate a decrease in palatability except that thallium bait dropped from 59% acceptance after 14·2 in. of rain to 11% after 28·9 in. Repellents tested at the same time (mink castor, peppermint oil, and Z.I.P.) were a complete failure.

A laboratory bio-assay experiment was made to determine the palatability and the lethal properties of fresh and leached poison baits: '1080' coated with safflower oil (very resistant to weathering); soaked '1080' (fairly resistant); Castrix (much weakened by weathering); tetramethylene disulpho tetramine (erratic in its behaviour); Promurit.

It was found that mice will consume 90% of cork treated with safflower oil even when a supply of untreated wheat is present; in similar conditions they will not touch untreated cork. Nearly 75% of the seed coat of wheat treated with safflower oil was consumed by mice compared with 25% of untreated; and 80–90% of previously unacceptable Douglas Fir seed coat was consumed. Safflower oil is a product of the seed of *Carthamus tinctorius*, an annual plant cultivated in Egypt for the dye extracted from its flowers.

458. EADIE, W. R. **[Control of rodents.]** *Amer. Nurserym.* 95 (5), 1952 (12).

A rosin-alcohol solution (10 lb. powdered rosin in 1 gal. ethyl alcohol, left 2 days to dissolve at a room temperature of 70°) painted on dry trees and shrubs to the height at which injury is likely to occur with normal snowfall, is a repellent for cottontail rabbits.

459. MERTHYR, LORD. **The rabbit problem [in Great Britain].** *Quart. J. For.* 46 (3), 1952 (147–52).

The seriousness of the damage done by rabbits to trees and crops in the U.K. needs no emphasis, but opinions differ on the most promising method of exterminating them. In this article, the author, who lives in one of the worst infested counties of Britain, yet who has been so successful in his endeavours that he is able to plant without rabbit fencing, writes strongly on the uselessness of trapping, which, he maintains, far from destroying, tends to encourage the rabbit population. Almost any method is better than commercial trapping, and it is moreover right that owners should pay for the extermination of rabbits rather than receive money for their sale. He reviews the work being done by the County Agricultural Executive Committees, and ends with a plea for a concentrated drive by some public authority, either on a national or a regional scale, in which everyone concerned would be able to co-operate. *Author's summary.*

460. GRACIE, W. M. **The menace of the wild rabbit.** *Quart. J. For.* 46 (3), 1952 (166–70).

There has always been a greal deal of loose thinking about wild rabbits, and few people, other than foresters, realize quite what a menace they are to the agricultural and forestry economy of the U.K. In this article, the author, who is the Director of Infestation Control of the Ministry of Agriculture and Fisheries, discusses the whole question and sums up by saying that the issue is simple—one person may get a certain price for the wild rabbit meat sold by him, but at a cost to him, and probably to his neighbours, of something like three times the amount he receives. It would thus be well worth while for every landowner to spend money on effective rabbit clearance. The article also details the rights of a tenant under the Ground Game Act, 1880; discusses the powers of the County Agricultural Executive Committees, and emphasizes that effective rabbit control can be carried out only under a 'good neighbour' policy. *Author's summary.*

461. WHEELER, L. C. **Grey squirrel damage.** *Quart. J. For.* 46 (3), 1952 (202).

Describes the control methods employed on the Longleat Estate. Each of 5 keepers has to patrol a given area and produce an annual quota of tails based on the acreage and type of plantation in his area; tails above the quota are paid for at 1*s.* a time.

462. BUCKLAND, D. C., and MARPLES, E. G. **Rodent damage to Western Hemlock.** *For. Chron.* 28 (2), 1952 (25–30 + 1 plate]. 7 refs.

Investigation of scars on immature Western Hemlock on Turnour Island, B.C., showed that they were caused by the Douglas squirrel [*Sciurus douglasii douglasii*]. Trees less than 6 years old are not attacked, presumably because their bark is unpalatable.

463. TEVIS, L., JR. **Autumn foods of chipmunks and golden-mantled ground squirrels in the northern Sierra Nevada.** *J. Mammal.* 33 (2), 1952 (198–205). 12 refs. O.R.S.

Results of stomach analyses of *Eutamias quadrimaculatus*, *E. townsendi*, *E. amoenus* and *Citellus lateralis* for different habitats are given in graphs. During autumn 1950, most conifers in the region failed to set seed, and as the spring-flowering shrubs lost their flowers in late frosts and produced no fruit, there was a shortage of seed on the forest floor. One stomach of *E. quadrimaculatus* showed a trace of Douglas Fir seed, and 10% of the stomachs of *E. townsendi* contained small amounts of Jeffrey Pine seed. *E. townsendi* was the only species to collect seed. Of 85 cheek pouches of *E. townsendi*, 6% carried seeds of Jeffrey Pine. These facts suggest that this chipmunk is more detrimental to forest regeneration than the other species. Consumption of hypogeous fungi was heavy.

464. KANGAS, E. Hirven metsässä aikaan saamat tuhot ja niiden metsätaloudellinen merkitys. **[Damage to forests by elk, and its significance in the economy of the forest.]** *Suomen Riista, Helsinki* No. 4, 1949 (62–90). 9 refs. [Fi.e.] B.A.P.

A report on long-term investigations in various parts of Finland, but chiefly in the Evo preserves in Häme province. Trees injured are chiefly Aspen, Birch and Pine, though Rowan, Willow, Lime, Ash and Juniper are also attacked. Injuries are mainly confined to young trees between ½ m. and 2–3·5 m. in height. Young Pines tend to suffer injury in winter, and deciduous trees in summer. The elk may strip needles or leaves, take off branches, tops and shoots, break off the top part of the stem, or trample the bases. In older trees the elk may gnaw the bark or injure it with their antlers. Studies were made in experimental plots in Pine and Birch forests of the degree of damage when injuries are continued over more than 10 years. Nearly all the young trees were injured; the young Pine stands, however, suffered more than the Birch even when the number of injuries was the same. The amount of injury which can occur in one unfavourable year was studied on experimental plots in a young Pine forest, in which there was also abundant Spruce and some Birch. The Spruce was left untouched. About half the young Pine and all the Birches were injured; 10–11% of the young Pine and half the young Birch were destroyed beyond recovery. Pine suffers primarily through the loss of its assimilating organs, and the consequent weakening of the tree, though it is not necessarily killed. A change in the axis of the stem is also often caused through injury to the leader. Pine usually recovers after 4 (maximum 7) injuries, but the tree is markedly weakened. With Birch the loss of the assimilating surface is not so significant, and recovery is rapid. Birch recovers on an average from 5 successive injuries (maximum 10). Repeated injuries are not so serious as with Pine, but Birch which is broken

soon becomes infected. Aspen on the whole sustains worse injuries than Birch, but it recovers more easily than Pine. It also quickly becomes infected when broken, or when the bark is injured. An economic investigation of losses must take into account more than the number of trees damaged, i.e. permanence of injury, form defects etc. The decrease in value is most appropriately estimated in % of the corresponding value of a healthy forest.

465. Mooney, O. V. **Irish deer and forest relations**. *Irish For.* 9 (1), 1952 (11–27). 5 refs.

Describes the species of wild deer found in Ireland (red, fallow, Japanese, and roe deer) and the damage they do to plantations.

466. Woudt, B. D. Van't. **Damage by deer in the northern Kaimanawas**. *Repr.* from *New Zealand Science Review* 9 (8), 1951 (150–2). B.A.P.

Describes the chain of reactions in the plant succession which has set in throughout the mixed Red and Silver Beech state forests of this region, since the release of *Cervus elaphus* in 1905. The balance now existing between the available food and the deer population is described, and the effects of browsing on natural regeneration are discussed. Good regeneration is only found in some extensive areas of wind-thrown trees. Elsewhere seedlings are heavily browsed and frequently destroyed or deformed. [Cf. *For. Abstr.* 14 (No. 51).]

467. Kean, R. I. **Estimation of the effects of deer and opossums in high country**. *Repr.* from *New Zealand Science Review* 9 (8), 1951 (146–9). 17 refs. B.A.P.

Traces the progress of the establishment of a herd of *Cervus elaphus* in humid, mixed forest in New Zealand, based on observations in the Tararua Range. The deer prefer low (under 2000 ft.), open climax forest. Such forest is not very vulnerable. Soil protection is afforded by a wide range of species, which are not palatable to the deer, viz. *Blechnum discolor*, *Pseudowintera* spp., *Myrtus* spp. and *Suttonia australis*, and natural regeneration of the tree climax species, which are of low to moderate palatability, is favoured.

With deterioration in food quality in such forests, the deer invade the upper climax forest, which is more vulnerable. Here the fern and shrub species most useful as ground cover, viz. *Polystichum vestitum*, *Leptopteris superba*, *Astelia* spp., *Coprosma foetidissima* and *Olearia colensoi*, rank high enough in palatability to be regarded as staple deer foods. Moderate use improves the habitat for deer. The opening out of the forest brings a reduction in humidity, and the forest ground-cover changes from a fern basis to a herbaceous one. A large increase in the herd, however, can bring considerable damage. The best food for deer is found in sub-climax communities on slip faces, stream margins and in wind-damaged areas, where much damage can be done. Reductions in population do not always achieve soil protection, since the deer may concentrate in limited areas and will often persist in frequenting overbrowsed slopes. High-altitude tussock (*Danthonia flavescens*) grassland can also sustain severe damage. Opossum (*Trichosurus vulpecula*) are more restricted in their diet than deer, and although alone they do not prevent forest regeneration, they may considerably modify forest composition. The combination of deer and opossum may have devastating effects. [Cf. *For. Abstr.* 14 (Nos. 50–1).]

468. Turbott, E. G. **Effect of goats on Great Island, Three Kings, with descriptions of vegetation quadrats**. *Repr.* from *Records of the Auckland Institute and Museum* 3 (4/5), 1948 (253–72 + 13 plates). 30 refs. X.

A survey was made on Great Island of the Three Kings group to study the changes in vegetation brought about since the introduction of goats in 1889 and since their destruction in 1946. Three permanent quadrats have been established, in which the course of plant succession will be studied; they are described in detail. The most striking characteristic of the vegetation is the extent and uniformity of the predominating subclimax *Leptospermum ericoides* communities, the establishment of which is probably due to 2 factors: (1) widespread establishment of *L. ericoides* after Maori occupations, and (2) the selective effect of grazing and browsing by goats. The influence of the goats on bird and invertebrate populations is also discussed.

469. Helbsing. Hochwildsicherer Flechtzaun. [**A wattle fence secure against large game.**] *Forst u. Holz* 7 (16), 1952 (221). [G.]

Describes methods and costs of erecting the fence, which is supported on Oak posts 2·5 m. high, carrying 3 strands of wire. Between the Oak posts and held by the wire are Pine pickets 2–2·4 m. in height and with diameters ranging from 4 to 7 cm. The Pine pickets are derived from thinnings and trimmed with the axe. The entire cost is estimated at about DM3·01 per m. of fence.

470. Neetzel, J. R. **Power driving of wood fence posts**. *Minn. For. Notes* No. 4, 1952. pp. 2.

Describes the use and performance of small mechanical post drivers for driving wooden fence posts. A 2-man crew can drive about 30 posts/hour.

452. *Birds*

471. Lindroth, H., and Lindgren, L. Metson hakomisen metsänhoidollisesta merkityksestä. [**The significance for forestry of the capercaillie, *Tetrao urogallus* L., feeding on Pine needles.**] *Suomen Riista, Helsinki* No. 5, 1950 (60–81). [Fi.sw.e.] B.A.P.

After snow cover has attained a depth of 15–20 cm. Pine becomes the staple diet of *T. urogallus* in Finland. A study was made of the parts of the tree preferred, % of needle loss, and permanent damage to the trees. The ratio of needles taken to the total quantity in the crown varies from 5 to 50%. The birds usually feed on the same trees year after year. These are usually individuals which have been weakened in some way, being either dying back, decayed, malformed or mechanically injured. Since such trees are of no value to the forester, and since snow deeper than 20 cm. is comparatively rare in southern Finland, damage caused by capercaillie is insignificant in comparison with snow damage.

In the north the capercaillie does not, on the whole, feed in the moor forests.

453. *Insects*

See also Nos. 43–4.

472. Beal, J. A., Haliburton, W., and Knight, F. B. **Forest insects of the southeast: with special reference to species occurring in the Piedmont plateau of North Carolina.** *Bull. Duke Sch. For.* No. 14, 1952. pp. 168 + 34 plates. 93 refs.

473. Taylor, K. L. **Forest insects and wood-destroying insects of New South Wales. Parts IV and V. Insects attacking the living and dying trees.** *Tech. Notes For. Comm. (Div. Wood Technol.) N.S.W.* 5 (1; 2), 1951 (8–11; 22–5).

[Cf. *For. Abstr.* 13 (No. 1362).] Describes 3 species of longicorn beetle and moths of the families Cossidae, Hepialidae, Xyloryctidae and Pyralidae, and discusses their control.

474. Elliott, K. R. **A new method of assessing aerial spray deposits.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 8 (2), 1952 (1).

Describes the use of a dyed paper which records the size and number of droplets falling upon it.

475. Kerr, T. W., Jr. **Further investigations of insecticides for control of insects attacking ornamental trees and shrubs.** *J. econ. Ent.* 45 (2), 1952 (209–12). 6 refs. [University of Rhode Island, Kingston, R.I.]

[Cf. *For. Abstr.* 13 (No. 1361).] Presents the results of field experiments made in 1951 on *Mindarus abietinus*, *Adelges cooleyi*, *Nematus ventralis*, *Malacosoma americanum*, *Unaspis euonymi* and *Leucaspis japonica*, with recommendations for their control by means of various wettable chlorinated hydrocarbon materials, 40% nicotine sulphate, or acid lead arsenate.

476. Anderson, L. D., and Tuft, T. O. **Toxicity of several new insecticides to honey bees.** *J. econ. Ent.* 45 (3), 1952 (466–9). 12 refs. [University of California Citrus Experiment Station, Riverside.]

In laboratory tests malathon, parathion, BHC, EPN and lindane resulted in 100% kill of bees within a few minutes. Chlordane, heptachlor, dieldrin and aldrin gave 100% kill within 6 hours, while DDT, 0,0-diisopropyl 0-*p*-nitrophenyl thiophosphate (Compound 2456), and toxaphene gave 98–100% kill within 18 hours. Other less toxic compounds were also tested and the results are presented.

477. Weaver, N. **The toxicity of organic insecticides to honey bees.** *J. econ. Ent.* 45 (3), 1952 (537–8). 2 refs. [Texas Agricultural Experiment Station.]

The ascending order of toxicity of dusts was: chlordane, toxaphene, DDT, 3–5–40 (3% γBHC + 50% DDT + 40% sulphur), and dieldrin.

478. Blagbrough, H. P. **Reducing wildlife hazards in Dutch Elm disease.** *J. For.* 50 (6), 1952 (468–9).

A study of mortality of birds and mammals was made at Princeton after DDT spraying and it is concluded that it is possible to minimize such mortality without seriously reducing the effectiveness of programmes for control of Dutch Elm disease, by timing operations to take place before the arrival of migratory birds (pre-foliar treatment) or after the middle of July. Use of mist-blowers is advised.

479. Hamilton, C. C. **Toxicity of new insecticides to trees.** *Amer. Nurserym.* 94 (8), 1951 (15, 67–9).

Little or no damage was done to trees (mainly hardwood species, including Oak, Plane, Maple and Elm) when commercial preparations containing DDT, methoxychlor, DDD, BHC, HETP, TEPP, etc. were applied by mist-blower spray to control insects.

Hemiptera

See also Nos. 44–7.

480. Gipple, O. B., and Champlain, A. B. **The seventeen year locust.** *Pa. For. Wat.* 4 (3), 1952 (50–1, 64–5).

Notes on the life history of *Magicicada septendecim* and the type of damage it causes. [Cf. *For. Abstr.* 3 (38).]

481. Schimitschek, E. Ein neuer entomophager Pilz an *Dreyfusia nüsslini* C.B. **[A new entomophagous fungus on *D. nüsslini*.]** *Anz. Schädlingsk.* 25 (8), 1952 (115–6). 2 refs. [G.]

Describes briefly a fungus, which, in damp and shady conditions, can significantly reduce populations of *D. nüsslini*. The fungus has not been definitely identified, but probably belongs to the Hypocreaceae.

482. **Biological control of insects. A. *Carulaspis* [*Diaspis*] *visci* on Cedars [*Juniperus bermudiana*].** *Rep. Dep. Agric. Bermuda 1951*, 1952 (10–3).

Among the new predators introduced to Bermuda is a small coccinelid, *Microweisia suturalis*, which appears to be establishing itself satisfactorily. A number of other coccinelids are also being tried. [Cf. *For. Abstr.* 13 (Nos. 3152–3).]

Lepidoptera

483. Adamczewski, S. Motyle minujące na tle naturalnych środowisk Białowieskiego Parku Narodowego. **[Ecological studies on mining Lepidoptera in the National Park of Białowieża.]** *Ann. Univ. M. Curie-Skłodowska, Lublin 5C* (4), 1950 (135–95). 26 refs. [Pol.pol.russ.e.] L.S.

The biocoenoses of a number of natural and artificial vegetation types within the National Park (both inside and outside the forest) were examined with special reference to populations of mining Lepidoptera. The following differences were noted between (*a*) natural vegetation types and (*b*) cultivated environments. In (*a*) insect species are evenly distributed, in (*b*) they are concentrated in 'refuges'; in (*a*) there is a definite vertical distribution of Lepidoptera which is much less distinct in (*b*); in (*a*) populations tend to be in equilibrium, whereas mass occurrences of individual species are often observed in (*b*).

484. STARK, R. W. **Sequential sampling of the Lodgepole needle miner [*Recurvaria milleri*].** *For. Chron.* 28 (2), 1952 (57–60). 3 refs.
Cf. *For. Abstr.* 13 (No. 2294).

485. MATTHYSSE, J. G., and NAEGELE, J. A. **Control of several tree and shrub leaf miners.** *J. econ. Ent.* 45 (3), 1952 (377–83). 12 refs. [Cornell University, Ithaca, N.Y.]
The results are presented of tests with several of the newer insecticides. For *Fenusa pusilla* the following were effective: 5 lb. 40% chlordane wettable powder, 1 lb. 25% lindane wettable powder, and 0·5 pint of 50% Systox emulsifiable solution, all in 100 gal. water. For *F. ulmi*: 4 lb. 40% chlordane wettable powder, 1 lb. 25% lindane wettable powder, and 1 pint 50% Systox emulsifiable solution, all in 100 gal. water. Lindane is considered the most practical of the insecticides for both species. Treatments should begin when the mines of the first-instar larvae first appear. None of the preparations tested was effective against larvae of *Phytomyza ilicis*. For *Monarthropalpus buxi*, 1·5 lb. 15% parathion wettable powder in 100 gal. water gave complete control. Two lb. 15% parathion wettable powder in 100 gal. water was highly effective against *Argyresthia thuiella*.

486. VOÛTE, A. D. Aantasting van Douglas door de lariksmot (*Coleophora laricella* Hb.). **[*C. laricella* on *Pseudotsuga taxifolia*.]** *Ned. Boschb.-Tijdschr.* 24 (9), 1952 (244–6). 2 refs. [Du.e.]
Larvae of *C. laricella* were found feeding on needles of Douglas Fir in 1950 and 1951. In 1952 normal adults developed. Development was similar to that on Larch and covered the same period. Mortality in the mining stage was estimated at 93%. Oviposition on Douglas Fir takes place only when stands are near heavily infested Larch. There is no evidence of a special strain adapted to Douglas Fir.

487. SMITH, C. C. **Control of the Lilac leaf miner, *Gracilaria syringella* (F.).** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 8 (2), 1952 (1).
Almost complete control can be effected by spraying with DDT.

488. FORSSLUND, K.-H. Aspbladsmalen, en ny skadegörare på asp. **[*Leucoptera sinuella*, a new pest of Aspen.]** *Skogen* 39 (6*/7*), 1952 (67*). [Sw.]
A stand of Aspen in Västerbotten in which the leaves were shrivelled and black was found to be infested with *L. sinuella*. The leaves were also attacked by *Fusicladium radiosum*, which caused the blackening. Similar damage has been found in other parts of Norrland.

489. RADCLIFFE, D. N. **An appraisal of seed damage by the Douglas Fir cone moth [*Barbara colfaxiana*], in British Columbia.** *For. Chron.* 28 (2), 1952 (19–24). 2 refs.

490. BENJAMIN, D. M. **The Jack-Pine budworm —a menace to Michigan Jack Pine.** *Tech. Note Lake St. For. Exp. Sta.* No. 376, 1952. pp. 1.
Discusses the damage to Jack Pine during the last 3 years by Jack-Pine budworm, a biological variety of Spruce budworm.

491. WELLINGTON, W. G. **Air-mass climatology of Ontario north of Lake Huron and Lake Superior before outbreaks of the Spruce budworm, *Choristoneura fumiferana* (Clem.), and the forest tent caterpillar, *Malacosoma disstria* Hbn. (Lepidoptera: Tortricidae; Lasiocampidae).** *Canad. J. Zool.* 30 (2), 1952 (114–27). 4 refs. [Forest Insect Laboratory, Sault Ste. Marie.] P.R.
Previous work showed that ideal physical conditions for the development of the Spruce budworm occur when the weather is relatively dry and clear. These conditions have tended to occur in summers when the annual number of cyclonic centres passing over the area was declining, and have preceded past outbreaks [cf. *For. Abstr.* 12 (No. 3467)]. On the other hand, the physical requirements of the forest tent caterpillar include warm, humid, cloudy weather during much of the larval stage, and outbreaks of this species in Ontario have begun after an increase in the annual number of cyclonic passages. *From author's summary.*

492. ROMANOVA, JU. S. O biologičeskom metode borjby s koljčatym šelkoprjadom. **[Biological control of *Malacosoma neustria*.]** *Dokl. vsesojuz. Akad. sel.-hoz. Nauk Lenina* 16 (12), 1951 (30–4). [Russ.] A.P.B.
During an outbreak of *M. neustria* near Moscow in 1948–9, high percentages of cocoon parasitization (up to 60%) were observed, the chief parasites being several species of *Pimpla* (with the hyperparasite *Theronia atalanta*), *Pteromalus puparum*, and tachinids. The chief aim of the work reported, however, was to study the egg parasites in material collected in various parts of Russia in 1948–50. Near Moscow the chief egg parasite was *Telenomus laeviusculus*; in Bashkiria the prevalent species were *T. laeviusculus*, *T. terebrans*, *Ooencyrtus concinnus* and *O. tardus*; and in Crimea, *O. concinnus*, *O. tardus*, *O. masii* and *Anastatus bifasciatus*. Figures are quoted for the % parasitization of the egg masses, which rose steeply in 1949 as compared with 1948 and in some localities reached an average of 66–73%. An account is given, based mainly on laboratory observations, of the morphological features and biology of *T. laeviusculus*. Adults of this species fed in nature on nectar of Maples, Spiraea and umbellifers, and had an adult life of 3–4 weeks in the laboratory. From the Moscow material no ♂s were bred out; in other regions the ratio of ♂s to ♀s was ca. 1/100. Larval development, including the winter diapause, lasts 11 months, both parasite and host having 1 generation per year. Some data are included on the effect of atmospheric factors on the parasite. A dry atmosphere or strong winds considerably increase its mortality in the emergence period, the optimum conditions for the pupal stage, in spring, being a temperature of 23–30° C. with relative humidity of 70–90%.
Observations near Moscow in 1948–9 showed that the % of egg masses attacked by parasites was considerably higher in orchards of fruit-bearing age than in younger ones.
In spring 1950, 15,000 egg masses from areas of high parasite populations were introduced in Ufa.

By the summer, the parasite population and the parasitization of egg masses were high.

Recommendations are made on the collection and winter storage under Russian conditions of infested egg masses for breeding out parasites to be used in biological control.

493. Thomson, M. G. **Western Hemlock looper.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 8 (3), 1952 (3).

Examination of the records of 12 weather stations near outbreaks in British Columbia showed that there was a significant deviation from the long-term average of September rainfall for each station immediately before an outbreak. This is characterized by an extremely dry September 3 years before the first peak flight.

494. Kinghorn, J. M. **Western Hemlock looper egg sampling.** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 8 (3), 1952 (3–4).

During the 1943–6 outbreak of *Lambdina* [*Ellopia*] *fiscellaria* var. *lugubrosa* in British Columbia, egg counts proved to be the most practical method of detecting areas of population extremes. Several relatively small trees were felled in each area sampled, and from each tree several samples were taken at intervals along the trunks. Population estimates were based on the average numbers of eggs/sample on the group of trees felled in an area. General observations made at that time indicated that egg deposition increased with height above ground and that it reached a maximum density at about the base of the crown, above which it declined.

The difficulties of analysing the data statistically are stated, and the methods used are explained. Analysis of the data for trees in different height classes gave the following regression: $P = a + b(H)$, where P is the % of the total number of eggs on a tree at a given height, H is the height above ground in feet, b is the regression coefficient and a is a constant. In the analyses of variance, the variance ratios of the regression coefficient are significant at the 1% level for all but the shortest height class. The practical inference drawn from this analysis is that butt sampling can be just as reliable as multiple sampling. By adjusting the butt sample counts with the appropriate regression formula for the total height of the tree, a good estimate of the average number of eggs per sample for the whole tree should be obtainable. By eliminating the task of felling trees, butt sampling would save a great deal of time, which could be used to obtain samples from more trees in each area and thus increase the accuracy of the population estimate. It is pointed out, however, that all these data were obtained from epidemic areas and that oviposition was heavy. It may well be that in a light epidemic the moths lay their eggs only at the optimum heights on the tree trunks.

At the time when these data were collected, observations indicated that oviposition increased with the density of moss on the sample, but the distribution of moss on the trees is such that it only seems to strengthen the positive correlation between egg density and height on tree. It is possible that moss density is the strongest single factor influencing place of oviposition.

495. Bleiweis, S. Nov gozdni škodljivec se bliža Sloveniji. [**A new forest pest comes nearer to Slovenia.**] *Gozd. Vestn.* 10 (5/6), 1952 (154–8). [Sloven.]

Describes the biology of *Hyphantria cunea* and methods of controlling it. Since 1948, the pest has been observed in northern Serbia and Croatia. Many broadleaved species are attacked.

496. Fice, K., and Vaclav, V. Gubar u Bosni i Hercegovini. [***Lymantria dispar* in Bosnia and Herzegovina.**] *Godišnj. Inst. nauč. šumar. Istraž., Sarajevo* No. 1, 1951 (36–79 + 1 tbl. + 4 maps). [Croat.e.g.]

The immense damage done to forest and fruit trees during the 1946–9 epidemic (which culminated in 1948) is discussed. Studies were made in 1949 on the pest's biology and development. Eggs were found to be most numerous on Beech. Research was also done on the tree species most favourable to normal growth of the insect. Parasites and predators were listed: *Anastatus disparis* was not present, but tachinids were found as parasites of a large proportion of the pupae. The organization of control from the air, using Pantakan (16·5% emulsion of a DDT preparation), is described. Four aeroplanes were used and 8000 ha. of woodland treated. There was very little damage from *L. dispar* in the treated area in 1949. *From authors' summary.*

497. Karpiński, J. J. Z badań nad zdrowotnością jaj mniszki (*Lymantria monacha* L.). [**Studies on the viability of the eggs of *L. monacha*.**] *Sylwan* 96 (2), 1952 (174–5). [Pol.pol.russ.]

Summarizes results of an investigation made from Nov. 1950 to Jan. 1951 in forests of NE Poland. The polyhedral virus disease can kill the embryos and larvae inside the eggs. In egg counts the material should be properly examined in order to exclude dead eggs of previous years.

498. **The bag-shelter moth (*Ochrogaster contraria*).** *Agricultural Gazette of New South Wales, Sydney* 62 (11), 1951 (597–9). O.R.E.

Notes on the life history and appearance of the moth, which is an important pest of *Acacia pendula* in New South Wales, and on the type of damage and control methods. Destruction by hand of the bag shelters is the most economical method.

Coleoptera

See also No. 237.

499. Peake, F. G. G. **On a Bruchid seed-borer in *Acacia arabica*.** *Bull. ent. Res.* 43 (2), 1952 (317–24). 3 refs.

Bruchus baudoni, whose life history is described, attacks both the stored seeds and the green pods of *A. arabica* before they have fallen from the trees. As a result of this attack a large proportion of the seed is spoiled. It is suggested that the pods might be treated successfully with a contact insecticide, since, once in every 6 weeks, the larvae move freely

among the pods, and would be susceptible to a residual deposit. Searches for a parasite are being made.

500. Głowacki, J. Wstępne wyniki obserwacji nad żerdzianką sosnówską w latach 1949–1950 na terenie nadleśnictwa Piękna Wieś. **[Preliminary results of observation on *Monochamus galloprovincialis* in 1949–50 in the Piękna Wieś forest district.]** *Sylwan* 96 (2), 1952 (176–84). [Pol.e.]

Presents the results of field observations and laboratory experiments on *M. galloprovincialis*, which has become one of the major Pine pests in the post-war period. The life cycle of the insect, the nature of the damage and the possibility of mass outbreaks in pure Pine plantations, are dealt with in some detail. Trap logs, particularly freshly cut stems of 10–20 cm. d.b.h., have proved to be a very effective means of control. The insect is often accompanied by *Phaenops cyanea*, *Acanthocinus aedilis*, *Tetropium luridum*, *Pissodes notatus*, and several species of barkbeetles.

501. Palm, T. Biologiska studier över *Tragosoma depsarium* L. i sydöstra Jämtland (Col. Cerambycidae). **[Biological studies on *T. depsarium* in S.E. Jämtland.]** *Opuscula Entomologica, Lund* 16 (1/2), 1951 (55–64). 3 refs. [Sw.g.] L.S.

An account of the development during the summer of 1950 of *T. depsarium* on old fallen Pine trees in an area where the trees were killed by fire in 1927. *Toxotus cursor* and *Leptura virens* were also present.

502. **[A weevil attacking *Pinus radiata*.]** *Rep. Selwyn Plantat. Bd. 1950/51*, 1951 (12).

An insect found attacking *Pinus radiata* was identified as a species of *Catoptes* that normally feeds on rape and turnips. It confined its activities to the needles and, unlike *Hylobius*, did not eat the bark. Damaged trees had a typical scorched appearance, with the needles hanging down where they had been eaten through by the weevil. Some leaders were almost completely defoliated.

503. Stobbenonderzoek. **[Research on stumps [as breeding areas for *Hylobius abietis*].]** *Meded. Inst. toegep. biol. Onderz. Nat.* No. 13, 1952 (34). [Du.]

An investigation showed that egg laying and larval development were not prevented or reduced in stumps from which bark had been removed immediately after felling in October, 1950. This result is contrary to results in practice and a larger-scale investigation is proposed. Egg laying in the spring of 1951 was very much reduced in stumps treated with 1% BHC in oil, and to a smaller degree in stumps treated with 10% BHC applied in powder form.

504. Ravensberg, K. Proeven ter bestrijding van de lapsnuittor (Taxuskever, *Otiorrhyncus sulcatus* F.). **[Experiments on the control of *O. sulcatus*.]** *Jaarb. Ver. Proeft. Boskoop* 1951 (13–20). [Du.du.]

In nursery experiments on the control of larvae and beetles in test areas planted with *Hydrangea paniculata*, *Taxus baccata* and *Azalea pontica:* (1) The beetle was controlled by dusting Paratex on the ground at the rate of 35 g./RR² [= 14·19 sq. m.]. (2) Larvae were controlled by treating the soil, before planting, to a depth of 5 cm. with 2 kg. 5% DDT powder/RR². (3) Feeding larvae were controlled by wetting the soil with a 20% DDT emulsion at the rate of 50 c.c. in 70 litres water/RR². (4) Full-grown larvae were controlled by soaking the root ball for 1 min. in an emulsion of 20% parathion or E605 preparation. (5) Full-grown larvae in the ground were controlled by wetting the ground with an emulsion of 20% parathion or E605 product. The cost of preventive treatment with 5% DDT powder was about Fl. 1·80/RR² and of watering with DDT emulsion Fl. 1·80–3·0.

505. Èdeljman, N. M. Nekotorye osobennosti fiziologičeskoĭ reakcii želudevogo dolgonosika (*Balaninus glandium* Marsch) na deĭstvie DDT, GHCG i dihloretana. **[Some features of the physiological reaction of *B. glandium* [larvae] to DDT, BHC and dichlorethane.]** *Dokl. Akad. Nauk SSSR* 81 (1), 1951 (117–20). 2 refs. [Russ.] A.P.B.

With particular reference to respiration, and fat and body-water contents. Resistance to all three insecticides varied with season, e.g. dichlorethane gave best results in July, when 200 g./sq. m. gave a 90% kill of the larvae, whereas in early June 400 g./sq. m. killed only 85%. DDT, BHC, and their mixture also gave the best kill in July. In this month respiration is at a maximum and fat content at a minimum, while the water content remains fairly constant. Conditions increasing respiration will therefore increase the efficiency of the insecticides. The insecticides themselves have different physiological effects: dichlorethane greatly reduces respiration; DDT, BHC, and especially their mixture, increase the rate of respiration and thus lead to loss of fats and body water. Loss of fats is important since the larvae do not feed while in the soil, and those that were not killed outright were too exhausted to pupate. The mixture gave better results than either BHC or DDT separately.

506. Frappa, C. Sur la présence de *Gonipterus scutellatus* Gyll. dans les peuplements d'*Eucalyptus* de Madagascar et l'acclimatement d'*Anaphoidea nitens* Gir., insecte auxiliaire parasite. **[The presence of *G. scutellatus* in the *Eucalyptus* plantations of Madagascar and the introduction of *A. nitens* as a parasite.]** *Rev. Path. vég.* 29 (4), 1950 (183–9). 5 refs. [F.] I.M.I.

Preliminary experiments in controlling a recent outbreak with *A. nitens* gave promising results.

507. Robert, A. Notes biologiques sur les principaux insectes parasites des charançons de l'orme: *Eubadizon magdali* Cress., *Spathius canadensis* Ash. (Braconides), *Trigonura tarsata* D.T., *Trigonura* sp. (Chalcidides, Hyménoptères). **[Biological notes on the main insect parasites of *Magdalis barbita*, *M. armicollis* and *M. inconspicua* : *E. magdali*, *S. canadensis*, *T. tarsata* and *T.* sp.]** *Ann. ACFAS* 17, 1951 (138–42). [F.] L.S.

508. Robert, A. Rôle respectif de chacune des espèces parasites dans la réduction des charançons

de l'orme. **[The rôle of individual parasitic species in reducing the numbers of *Magdalis barbita, M. armicollis,* and *M. inconspicua.*]** *Ann. ACFAS* 17, 1951 (143–7). [F.] L.S.

Results of observations from 1947 to 1950 show that parasitization in S. and Central Quebec by *Trigonura tarsata* and *T.* sp. is fairly stable, while that by *Eubadizon magdali* and *Spathius canadensis* is increasing.

509. LEKANDER, B. En ny metod för bekämpning av granbarkborren, *Ips typographus* L. **[A new method of controlling *I. typographus.*]** *Medd. SkogsforsknInst., Stockh.* 41 (3), 1952. pp. 31. 4 refs. [Sw.g.] Price *Kr.*2.

In chemical barking experiments in 1948 using Na arsenite, barkbeetle attack largely failed to develop in treated trees. In May 1949, 4 holes per tree were bored, 2 cm. in diam., 4 cm. deep and ca. 1 m. above ground level, in freshly attacked Spruce trees, filled with a DDT emulsion, a thiophosphate preparation, Na arsenite, or Zn fluosilicate, and plugged with corks. Examination in the autumn showed that As and F_2 had killed larvae and beetles within certain limited areas, viz. strips several cm. broad above the bore holes. In 1950 experiments were made in which a Zn fluosilicate paste was spread on a 10-cm. ring from which the bark had been removed, and covered with tarred paper. Examination in the autumn showed that beetle development above the ring had stopped completely, but was normal below the ring; chemical tests showed that F_2 was present to the tip of the stem. However, in trees treated after the emergence period, insect development was normal, the larval tunnels interrupting the flow of the chemical up the tree. Tests in 1951 showed that 10- and 5-cm. rings (using 70 and 38 g. chemical/tree) would stop insect development in trees up to 29 cm. d.b.h., while 2-cm. rings (25 g. chemical) controlled attack in trees up to 21 cm. d.b.h. In autumn 1950 and May 1951 tests were made to see if treated trees were suitable as traps. The trees (left standing) treated in autumn were not attacked by *I. typographus* although neighbouring trees were attacked. The 65 trees treated in May were felled in groups of 5 at daily intervals until 15 May, and the last 10 trees were left standing. The ring breadth used was 10 cm. Results of an autumn injection show that the poison was slightly effective in the trees felled 4 hr. after treatment and fully effective in trees felled 3 or more days later. Beetles attacked the treated trees in normal numbers, the felled trees more heavily than those left standing. If rings 5 cm. broad are used, costs of the poison amount to about 15 øre/tree. In an attempt to reduce working time, the poison was applied in a frill girdle made by axe; results were very uneven and the method is not recommended. A special tool designed to facilitate ring-barking consists of 2 shafts 90 cm. long, meeting at a common pivot, each with a trunnion carrying a sharp-edged disc. 2 cm. in diam. The position of the trunnions on the shafts can be adjusted according to tree diameter. The tool is placed round the trunk and given a half turn; this cuts through the bark in a complete circle and is repeated at a distance of 5 cm. or more; a vertical knife-cut is then made between the two parallel circles and the bark between them can be removed with ease.

510. LEKANDER, B. Nyare bekämpningsmetoder mot granbarkborren. **[New methods of controlling *Ips typographus.*]** *Norrlands SkogsvFörb. Tidskr.* 1951 (1), (9–22). 8 refs. [Sw.] (*Medd. Skogsforskn-Inst., Stockh., Ser. Uppsatser* No. 19).

Discusses the use of trap trees treated with chemicals, including DDT and diesel oil. Describes methods tested by the Swedish Forest Research Institute (1) of killing beetles and larvae in newly attacked standing trees by ring-barking the tree and applying osmotic Fluralsil and (2) of killing overwintering beetles by poison-spraying the moss and litter within a radius of 1 m. of recently killed trees; preliminary experiments indicate that Gesarol (an emulsified DDT preparation) gives the best results. Burning over the area immediately round stumps is also suggested as a method of killing overwintering beetles.

511. FRANCKE-GROSMANN, H. Über die Ambrosiazucht der beiden Kiefernborkenkäfer *Myelophilus minor* Htg. und *Ips acuminatus* Gyll. **[The ambrosia fungi of *M. minor* and *I. acuminatus.*]** *Medd. SkogsforsknInst., Stockh.* 41 (6), 1952. pp. 52. 45 refs. [G.g.sw.]

The typical bluing fungi in the larval tunnels of *M. minor* were found to be *Trichosporium tingens* and *Ophiostoma canum*; and in those of *I. acuminatus*, *T. tingens* var. *macrosporum* var. nov. and *O. clavatum.* Other fungi present, not specific to these beetles, included *O. coeruleum* and *O. piceae.* Yeast fungi were also found in the tunnels of both the beetles; one, isolated from a branch attacked by *I. acuminatus*, was identified as *Dipodascus aggregatus* sp. nov. The *Trichosporium* spp. were found at all stages of beetle development and are considered the most important. The development of the fungus in the wood and in the laboratory is described. Fragments of *Trichosporium* were found in the intestines of larvae of both species. When young beetles of *M. minor* left their breeding tunnels to feed on young Pine shoots, *T. tingens* was found in the young shoots 7 days after the attack began. It is not certain how the beetles transfer the fungi to their new feeding ground. The nature of the symbiosis between beetle and fungus is discussed. [Cf. *For. Abstr.* 13 (No. 2555).]

512. SCHWERDTFEGER, F. Untersuchungen über die Wirkung von Hexamitteln bei der Engerlingsbekämpfung im Forstschutz. **[The effectiveness of BHC in control of cockchafer larvae in the forest.]** *Repr.* from *Zeitschrift für Pflanzenkrankheiten und Pflanzenschutz, Stuttgart* 57 (7/8), 1950 (246–72). 28 refs. [G.g.]

Presents the results of large-scale experiments in north-western Germany. [Cf. *For. Abstr.* 13 (No. 503).]

513. SCHNEIDER, F. Vergleichende Bekämpfungsversuche gegen Maikäfer (*Melolontha vulgaris*) mit Hexa und DDT in Alpnach (Obwalden). **[Comparative trials in the control of *M. melolontha* with BHC and DDT in Alpnach (Obwalden).]**

Schweizerische Zeitschrift für Obst- und Weinbau, Bern 59 (22–23), 1950 (397–405; 425–31). 6 refs. [G.g.] L.S.

514. Gasser, R., and Wiesmann, R. Contribution à l'étude écologique et à la destruction du hanneton (*Melolontha melolontha* L.): observations et essais effectués à Sarrebourg en 1949. **[Ecology and control of *M. melolontha*: observations and trials made at Sarrebourg in 1949.]** *Rev. Path. vég.* 29 (1/2), 1950 (43–101). 36 refs. [F.f.e.] I.M.I.

[Cf. *For. Abstr.* 11 (No. 3355).] Ecological observations were made in Beech forests with a number of Oaks, on: density of cockchafer population; emergence; dates of the various flights; and species of trees attacked, Oaks and Beeches being heavily, Wild Cherry lightly and Ash not at all attacked. A DDT product, Gesarol Emulsion 9255, diluted to contain 15% of the active ingredient, was applied from a Piper Cub L4 plane on 3 and 4 May. The deposit per ha. was 3·9 kg. of the active ingredient, and it proved resistant to weather. The treated area amounted to 36 ha., consisting of a band 10·3 km. long and 35 m. deep along the forest edge, and 933 litres, or 26 litres/ha., of spray were used. The total cost of the treatment was Swiss Fr.455/km. for a strip 35 m. deep; if the spraying had been done a little earlier a strip 10 m. deep would have been sufficient and the cost would have been Fr.260/km. Treated areas were practically clear of beetles two or three days after treatment, while control areas were still infested. Cockchafers which reached the forest as late as the beginning of June were killed by the insecticide. The population of white grubs in the treated areas was reduced by 84%. The mortality among other insects as a result of the treatment is shown in tables.

515. Brammanis, L. Bidrag till kännedomen om för skogen skadliga bladhorningar i Sverige. 1. Trädgårdsborren, *Phyllopertha horticola* L. **[Lamellicorn beetles injurious to forests in Sweden. 1. *P. horticola*.]** *Medd. SkogsforsknInst., Stockh.* 41 (2), 1952. pp. 59. Many refs. [Sw.sw.g.] Price *Kr.*3.

Earlier investigations of the damage done by *P. horticola* in Sweden and elsewhere and of its distribution in other countries are discussed. In Sweden, it occurs between Skåne and S. Ångermanland and is frequent in the south and central parts of the country. Its morphology and life cycle in Sweden are discussed in detail. Larvae are often present in the soil in large numbers—100–200, and in some districts up to 400/sq. m. The roots of young Birch are severely attacked, but hardwoods generally recover from attack better than softwoods. The beetle prefers fairly light soil, with some but not too dense vegetation. For swarming and egg laying it seeks sunny, sheltered, abandoned agricultural land or grassland; favourable sites are frequent in central and S. Sweden. Recommendations for preventing outbreaks in nurseries include: (1) intensive soil cultivation and agricultural cropping before using the ground as a nursery; (2) removal of grass edges and strips and bushes in or near the nursery; (3) ploughing and harrowing before swarming takes place; (4) later sowing in danger areas so that they are free from vegetation at the swarming periods; (5) thorough weeding of seedbeds and lining-out beds; (6) covering seedbeds as a protection against egg laying; (7) watering to keep the beetles away from the seedbeds; and (8) providing nesting boxes for birds. Collecting the beetles proved ineffective as a control method. Larvae and pupae can to some extent be destroyed mechanically by ploughing and harrowing in spring and autumn. Good control was obtained by using DDT and BHC dusts. In 1949 and 1950, 80–100% of the beetles were killed by dusting during the flight period, several times as necessary, with a mixture consisting of 5% Gesarol [DDT] + 10% BHC at a rate of 5 kg./1000 sq. m. Dusting the soil, to kill beetles entering or leaving it, was also successful but a higher concentration (20 g./sq. m.) was needed. Larvae were successfully controlled by forking insecticides into the ground; an application of 20 g./sq. m. of Agrocide 3 (a 5% BHC preparation) killed 40–50% of the larvae within 2 weeks and all within 4 months. With a 1% BHC emulsion (Liquid Agrocide) at least 4 litres/sq. m. were needed to reduce the larval population by 60% in a month. BHC preparations can also be used in the planting hole or mixed with the soil during transplanting, but the fine roots must not come in contact with the powder. Tests with larvae of *Amphimallon solstitialis* showed that 20 g. Agrocide 2 (3·5% BHC)/hundred 2-year old Pine plants is sufficient to protect them. In 1949 plants to a value of Kr.14,735 were destroyed in one nursery; the costs for control amounted to Kr.400. [Cf. *For. Abstr.* 13 (No. 1140).]

Hymenoptera

See also Nos. 239, 485, 791–2.

516. Reeks, W. A. **Establishment of *Exenterus* spp. (Hymenoptera: Ichneumonidae), parasites of the European Spruce sawfly, near points of introduction.** *Repr.* from *Canad. Ent.* 84 (3), 1952 (76–86). 12 refs.

Six species of *Exenterus* parasitic on *Gilpinia hercyniae* have been liberated in eastern Canada since 1933, and 4 of them have been recovered from the sawfly near liberation points in the Maritime Provinces. *E. claripennis* was the chief species recovered while sawfly populations were fairly high. When the sawfly populations (larvae or cocoons) fell to about 1 per sq. ft. sample, *E. vellicatus* predominated. After becoming established in the stand, the population of the parasite tends to vary directly with that of the sawfly. The most important factor affecting parasite numbers was a virus disease of the sawfly larvae. After 1938 the disease destroyed most of the host larvae during the period when second-generation parasite adults were present in the field. Extermination of the parasites was prevented by diapause, which enabled some of them to carry over the unfavourable period until the following year. [Cf. *For. Abstr.* 7 (No. 968).] *From author's summary.*

517. Heqvist, K.-J. Några iakttagelser vid en härjning av bleka tallstekeln (*Diprion pallidum*

Klug.). [**Observations on an outbreak of *Gilpinia pallida*.**] *Svenska SkogsvFören. Tidskr.* 50 (2), 1952 (221–30). 16 refs. [Sw.g.] (*Medd. Skogsforsknlnst., Stockh., Ser. Uppsatser* No. 23).

An account of an outbreak in 1946 on an island in a Central Swedish lake, on Scots Pine. Ca. 10 ha. were defoliated, the attack spreading also to Norway Spruce, Juniper and heather. Features of the sawfly's biology, and parasites found, are noted. No outbreak occurred in 1947.

518. BURNETT, T. **Effects of temperature and host density on the rate of increase of an insect parasite.** *Amer. Nat.* 85 (825), 1951 (337–52). 14 refs. O.R.S.

In a laboratory experiment cocoons of *Neodiprion sertifer* were used as the hosts and *Dahlbominus* (*Microplectron*) *fuscipennis* as the parasite. Results showing the effect of 7 host densities ranging from 0·06 to 1·56 cocoons/sq. in. at temperatures of 16, 20 and 24° C. on parasitization are given in graphs and tables. Increase in temperature and in host density caused a large increase in the ratio of parasites emerging to hosts emerging in a single parasite generation.

519. BIRD, F. T. **On the artificial dissemination of the virus disease of the European Pine sawfly, *Neodiprion sertifer* (Geoffr.).** *Bi-m. Progr. Rep. Div. For. Biol. Dep. Agric. Can.* 8 (3), 1952 (1–2).

Earlier experiments were carried out with a hand-operated sprayer [cf. *For. Abstr.* 12 (No. 2436)]. In 1951 a mist-blower was used. The blower (Microsol Model 304) was placed at the edge of a plantation on the windward side. According to the rate of wind blowing at the time, the virus suspension was disseminated over areas of 5–7 acres. It was found that the rate of mortality increased as the concentration of virus in water was increased from 100,000 polyhedra/c.c. to 20,000,000/c.c., but the area over which mortality was caused did not increase appreciably when the concentration was increased beyond 1,000,000 polyhedra/c.c. An increase in the volume of suspension disseminated greatly increased the area over which mortality was caused. Thus the results indicated that by this method of application, much greater mortality would result at a virus concentration of 1,000,000 polyhedra/c.c. if 10 gal. of the suspension were disseminated than 1 gal. at 10 times the concentration. Best results were obtained at night, from 9 p.m. to midnight.

Diptera

See also No. 485.

520. CLARK, J. **The Spruce bud midge, *Rhabdophaga swainei* Felt (Cecidomyiidae: Diptera).** *Repr.* from *Canad. Ent.* 84 (3), 1952 (87–9). 2 refs.

Notes on the midge, its habits, life history, hosts, and distribution in Canada, and on symptoms of attack.

459. *Other Animals*

521. NEISWANDER, R. B. **Control of mites on woody ornamental plants.** *J. econ. Ent.* 45 (3), 1952 (373–6). 2 refs.

A high % of Spruce mites (*Paratetranychus ununguis*) on *Juniperus* spp., *Picea abies* and *Thuja* sp., were killed by a 10% dust of *p*-chlorophenyl *p*-chlorobenzene sulphonate applied by aeroplane during May. A trialkyl thiophosphate and Compound 4049, a commercial product of the American Cyanamid Co., were also very effective.

522. MATTHYSSE, J. G., and NAEGELE, J. A. **Spruce mite and southern red mite control experiments.** *J. econ. Ent.* 45 (3), 1952 (383–7). 1 ref. [Cornell University, Ithaca, N.Y.]

The experiments were carried out on *Rhododendron* sp., *Picea abies* and *Ilex opaca*. Di-*p*-chlorophenyl methylcarbinol (TM-1), parathion, Systox, Aramite, EPN (ethyl *p*-nitrophenylthionobenzenephosphonate) and selenium all produced high mortality of motile mites within one day of treatment. EPN gave good residual action. Aramite and TM-1 were variable in residual effectiveness. TM-2 (*p*-chlorophenyl *p*-chlorobenzene sulphonate) was slow acting against motile mites, but consistently gave long residual action, and appears to be suitable for single-application control of both species.

46. DAMAGE TO TREE GROWTH BY MAN

See also Nos. 40, 221, 240.

523. OLSON, D. S. **Underground damage from logging in the Western White Pine type.** *J. For.* 50 (6), 1952 (460–2).

Discusses the damage to roots of the residual stand, especially to shallow-rooted species such as *Pinus monticola*, caused by tractor skidding, particularly of untrimmed tree-length logs, mechanical slash-piling, and the formation of tracks by bulldozing.

48. INJURIES DUE TO UNKNOWN OR COMPLEX CAUSES

See also No. 438.

524. **Pole blight: what is known about it.** *Misc. Publ. Nth. Rocky Mt. For. Range Exp. Sta.* No. 4, 1952. pp. 17. 26 refs.

A report by the Pole Blight Investigations Steering Committee on the extent of pole blight in the U.S.A. and Canada, the search for causes, and experimental control.

525. SPURR, S. H. **Forest inventory**. Ronald Press Co., New York. 1951. pp. xii + 476. 736 refs. Price $8·50 (£3. 13*s*.)

A comprehensive report on modern mensurational techniques. It deals with the measurement of trees and stands, the estimation of their volume, the prediction of growth, and sampling problems involved in the design of forest inventories. A large amount of original material has been added to a critical survey of previous work in the field of forest mensuration. One object of this study is to develop simpler and more accurate methods of correlating forest volume and growth with measurements made on aerial photographs and on the ground. Over 700 bibliographical references are given, covering most N. American work and a representative selection of European work. *From author's preface.*

52. MEASUREMENTS OF STEM DIMENSIONS AND VOLUME OF TREES, STANDS, FORESTS AND TIMBER

521. *Diameter (Girth) and Sectional Area*

See also No. 914.

526. VAUX, C. H. **Instrument for determination of tree diameters in inches at any height**. *J. For.* 50 (8), 1952 (601–4). 4 refs. [School of Forestry, Fort Collins, Colorado.]

The instrument (illustrated) employs the level bubble and graduated arc as a means of determining the angle of sight above or below the horizontal. A scale is seen projected across the diameter of the tree at the point to be measured. Both level bubble and projected scale can be seen at the same time through the eyepiece. The instrument measures $5 \times 3\frac{1}{2} \times 2$ in. and may be held free in the hand or be mounted on a Jacob staff; the latter is advisable for close work. Its use to obtain (1) an unknown diameter at a given height with a known base, and (2) the % of taper outside bark of some point on the tree without a measured base, is explained. Most men can be trained to use it with sufficient accuracy to obtain diameters at any visible point with an accuracy sufficient for purposes of timber estimating. It can be used with reasonable accuracy to a distance of ca. 200 ft., and will perform the usual functions of an Abney level.

527. HENRIKSEN, H. A. Dimensionsklasseforedeling for bøg. **[Diameter-class distribution for Beech.]** *Forstl. Forsøgsv. Danm.* 20 (3), 1951 (229–70). [Dan.e.]

Measurements made on 1289 trees are analysed and discussed in detail. The % distribution of branch volume by branch diameter classes can be determined fairly accurately from the mean stand d.b.h. and, within the limits of the material, is not influenced by tree height or the relative proportion of branch volume in the stand. The distribution of stem volume by diameter classes is shown in graphs and tables, with illustrations of errors that may arise from different causes. A combined table shows the distribution of stem volume, branch volume and total volume to diameter classes when d.b.h. and branch volume quotient (obtained from a graph based on d.b.h. and height) are known. These figures are compared with results obtained from commercial sorting based on diameter alone; the two sets of figures differ rather widely. Graphs are given showing the height at which a given diameter may be found in a given stand.

522. *Height, Length*

See also No. 533.

528. KRISHNASWAMY, V. S. **General formulae for measurement of heights of trees [with different degrees of lean]**. *Indian For.* 78 (7), 1952 (339–47).

Trigonometrical formulae are given for calculating the height of a tree with different degrees of lean, when the observer is standing (*a*) below, (*b*) above, and (*c*) between the top and bottom of the tree, formulae being given in each case for a tree (1) leaning towards, and (2) leaning away from the observer. The use of a simple clinometer is explained.

523. *Bark*

See also No. 533.

529. GUERREIRO, M. GOMES. Previsão do peso da cortiça explorável de um montado. **[Forecasting the weight of exploitable cork in a stand.]** *Publ. Serv. flor. aqüic. Portugal* 18 (1), 1951 (57–83). 8 refs. [Port.port.e.]

Demonstrates a method of forecasting yield of cork from work on a sample plot of 460 trees.

530. ANDERSSON, S.-O. Barkmasseprocenter för timmer och massaved av tall och gran i Norrland. **[Bark percentages for Pine and Spruce timber and pulpwood in Norrland.]** *Medd. SkogsforsknInst., Stockh.* 41 (5), 1952. pp. 40. 10 refs. [Sw.sw.e.] Price *Kr*.2.

The investigation was undertaken to obtain bark percentages applicable to timber volumes calculated from top diameter, length, and butt diameter, instead of from top diameter and length alone as in the rest of Sweden. For assessing the method, Norrland was divided into 4 zones, coastal north and south and inland north and south. Sample-tree material from the different zones was measured in 1-m. sections (in all 6100 Spruce logs and 1500 Pine logs), and bark percentages were calculated giving bark volume as a percentage of log volume u.b. The bark thicknesses obtained from these measurements were rather below those found in the State survey and percentages have therefore been corrected to apply to the average bark thicknesses obtained for each county during the survey. Bark volume percentages for the different provinces or counties for a series of log lengths and diameters are tabulated for Pine and Spruce. On the basis of the percentage for the different log dimensions, average bark percent has been calculated for timber and

pulpwood. For Spruce it has also been calculated for different altitudes, since Spruce bark % increases with altitude. For both species pulpwood has a higher bark % than sawtimber. There are significant differences between the north and south of Norrland, the bark % for Spruce being higher in the north and for Pine in the south.

524. *Determination of the Volume of Trees and Stands*

See also Nos. 259, 914.

531. Cubage estimatif des arbres sur pied. **[Estimating the volume of standing trees.]** *Norme franç.* No. NF*B*53–017, 1951. pp. 6. [F.]

States the rules for calculating the volume of timber and of firewood.

532. **Improved B-10 tree stick.** *J. For.* 50 (6), 1952 (508).

The B–10 Tree Stick, using basal area for obtaining tree volume and growth data, is now available from its inventor Fred B. Merrill, Zachary, La. It gives volume in cords or units of rough and peeled wood and solid cubic feet for tree heights 30 to 100 ft. by 10-ft. intervals. Timber estimates are shown by Scribner, Quebec, International, and lumber-scale volumes for form classes 70–84.

533. Grundner and Schwappach [Edited by Schober, R.] Massentafeln zur Bestimmung des Holzgehaltes stehender Waldbäume und Waldbestände. **[Volume tables for standing forest trees and crops.]** Paul Parey, Lindenstrasse 44–47, Berlin (Berlin-West) SW 68. 10th ed. (rev.). 1952. pp. 216. [G.] Price *DM*14·80.

The present edition of this standard work gives tables, in most cases of timber and tree volumes, small wood %, height-curve data, taper (o.b.), bark thickness, and assortments from the individual stem, for Oak, Beech, Scots Pine, Norway Spruce, European Larch, Silver Fir, Alder, Birch, Japanese Larch, American Red Oak, and Austrian Pine. Tables of stand form factors and mean stand height are included for all but the last three species, and there is also a table of sectional areas for diameters from 1 to 150 cm. Many of the auxiliary tables (e.g. taper, bark thickness and assortments) and some of the volume tables are new and have been included by the courtesy of various collaborators. The uses of the tables are explained in an introductory chapter.

534. Longhi, G. Tavole di cubatura dell'abete bianco e del faggio cresciuti nei boschi emiliani. **[Volume tables for *Abies alba* and *Fagus sylvatica* in even-aged stands in Emilia.]** *Ital. for. mont.* 7 (3), 1952 (150–1). [It.]

535. Longhi, G. Tavole di cubatura del pino nero, pino domestico e pino marittimo dei boschi emiliani. **[Volume tables for *Pinus nigra, P. pinea* and *P. pinaster* in Emilia.]** *Ital. for. mont.* 7 (2), 1952 (104–5). [It.]

536. Quintus, D. **Board foot volume table for Lodgepole Pine.** *Res. Notes Ore. St. Bd. For.* No. 3, 1951. pp. 2.

537. Unwin, P. T., and Bowling, P. J. **Production of volume tables for mature trees in Tasmania.** *Aust. For.* 15 (1), 1951 [1952] (31–46).

The production of volume tables for large mature Eucalypts and rain-forest hardwoods by a method suitable for Tasmanian conditions is described. The tables are produced from a minimum number of sample trees. They read directly the merchantable volume when g.b.h. is measured and the heights to the top and bottom of the millable log are estimated. Procedures of sample-tree measurement, table compilation and statistical testing are outlined. *Authors' summary.*

524.6. General Surveys of Forests and Whole Tracts of Forest. Partial Enumeration Surveys, Timber Cruising

See also No. 553.

538. Griffith, A. L. **East African enumerations. *Pterocarpus angolensis* in mixed woodland (Tanganyika).** *Emp. For. Rev.* 31 (2), 1952 (146–9). 3 refs.

The data discussed were obtained in typical good *Brachystegia/Isoberlinia* woodland in which *P. angolensis* forms 9% by number of the trees. It was shown that in this type of woodland, even when dealing with only one species which forms only about 10% of the crop, a sample of 5–10% properly taken is sufficient to give a volume estimate within the 20% margin of error which is considered sufficient for working-plan or sawmill purposes. Random sampling in tropical forest is not possible on account of the difficulty and expense. The sampling should therefore be by either systematic or stratified random strips.

539. Dawkins, H. C. **Experiments in low percentage enumerations of tropical high-forest.** *Emp. For. Rev.* 31 (2), 1952 (131–45). 3 refs.

A series of low-percentage enumerations was laid out in South Mengo, Uganda, and analysed statistically to investigate the alleged unreliability of such work in tropical forest. It was found that precision, i.e. smallness of sampling errors, depended on density of the desired population as well as on the number of samples available. The actual percentage of the samples was, in fact, of little significance compared to its comminution and the density of the observed quantities within it. Sampling errors of less than 20% were obtained on populations of more than two stems per acre by a 1% dispersed-plot enumeration of 7·5 square miles of highly variable forest.

While dispersed-plot enumerations gave more precise estimates—for equal areas sampled—than transect methods, yet the relative cheapness of the latter made them more efficient except in special cases. When dealing with areas of 5 to 15 square miles, two-per-half-mile stratified random chain-wide transects giving 5% cover are advocated for estimating populations with densities from one to ten stems per acre. For lower population densities or smaller areas higher percentage cover is likely to be necessary, while with increasing population or area, lower

percentages would give tolerable errors. Superimposed, dispersed-plot, 20% sub-samples of the transects were suitable for estimates of populations exceeding 10 per acre, if more than one square mile was originally covered.

It is urged that all management relying on enumeration results should be based on the lower fiducial limit and not on the mean of the sample. This value is more easily understood as the Reliable Minimum Estimate, a term here suggested for general use in forest sampling. *Author's summary.*

525. *Volume by Assortments. Merchantable Volume*

See Nos. 235, 431–3, 527, 533, 537.

526. *Log Measurement. Scaling*

540. WHITE, E. E. **Round log measuring.** *Timb. Tr. J.* 199 (3925), 1951 (1499–1500).

Advocates the general use of mean-proportion log scales and gives examples of their use compared with scales based on the present Hoppus and middle-diameter measures.

53. SPECIAL MEASUREMENTS OF TREES AND STANDS (CROWN DIMENSIONS, STAND DENSITY ETC.)

See also Nos. 176–7, 914.

541. BRIEGLEB, P. A. **An approach to density measurement in Douglas Fir.** *J. For.* 50 (7), 1952 (529–36). 19 refs.

The author has constructed tables showing: (1) standard number of trees/acre by average d.b.h. and average height, (2) standard basal area/acre by average d.b.h. and average height, and (3) average radius of growing space/tree for Douglas Fir stands of standard density by average d.b.h. and average height. The tables are based on data from thinned plantations in Denmark as well as natural unthinned stands in Washington. The use of the proposed standard is discussed. It is believed that optimum densities, which vary with objects of management, utilization, and marketing facilities, will be found to lie, for most combinations of factors, between 75 and 120% of the proposed standard.

54. ASSESSMENT OF SITE QUALITY

See also Nos. 29–31, 235.

542. EHWALD, E. Die Entwicklung der forstlichen Standortskartierung in Thüringen. **[The development of forest site mapping in Thuringia.]** *Schweiz. Z. Forstw.* 103 (8), 1952 (265–77). 23 refs. [G.f.]

543. WESTVELD, M. **A method of evaluating forest site quality from soil, forest cover, and indicator plants.** *Sta. Pap. Ntheast. For. Exp. Sta.* No. 48, 1952. pp. 12. 8 refs.

In a field test to determine whether data on present tree cover, minor vegetation and soils can be combined as guides to the climax forest types, two independent maps based respectively on interpretation of present forest cover and on soils, for an area in northern New Hampshire, were found to agree reasonably well. A hypothetical example is given of the compilation from separate maps of forest cover, ground vegetation, and soil types, of a single 'basic management map' showing climax types and site classes. Much research is still needed before the preparation of such maps for practical use becomes possible.

544. GOGGANS, J. F. **Topsoil and Pine trees in Alabama's Piedmont.** *Leafl. Ala. agric. Exp. Sta.* No. 31, 1951. pp. 5.

A study of 5- to 13-year-old plantations of Slash and Loblolly Pines in this region indicated that depth of soil above the compact clay subsoil is closely correlated with rate of height growth. Practical methods of measuring depth of topsoil as an indication of site quality are explained.

545. KITTREDGE, J. **Deterioration of site quality by erosion.** *J. For.* 50 (7), 1952 (554–6). 7 refs.

Site indexes from plantations of southern Pines in the south and of Black Locust in the north and south of the U.S.A. were analysed and compared, and it was found that when erosion reaches the stage of producing noticeable gulleys, site indexes are heavily reduced in comparison with those for plantations on old fields, doubtless eroded but not to the gulley stage.

546. Groeiplaats cultuurbossen. **[The sites of planted forests.]** *Korte Meded. Bosbouwproefsta. T.N.O., Wageningen* No. 12, 1952 (9–10). [Du.]

The quality class of Japanese Larch plantations increases with increasing phosphate content (determined in mg. soluble in citric acid/100 g. soil), with the strongest effect in the range $P_{citr.}$ 0–20. The quality class declines with increasing N content of soil and needles. Japanese Larch has an unfavourable effect on the soil, especially when the humus content is high. Both field capacity and structural stability of the soil—for the same humus content and the same soil type—are poorer under Japanese Larch than under native Oak, and the N content of the humus also appears to be reduced.

56. INCREMENT, DEVELOPMENT AND STRUCTURE OF STANDS

See also Nos. 197, 229, 231–3, 235, 251 *et seq.*, 314, 327 *et seq.*, 353.

547. LIU, S.-H. **A preliminary study of the growth regression of timber trees [*Chamaecyparis formosensis*] calculated by means of an alinement chart.** Taiwan Forestry Research Institute, Taipeh. 1951. pp. 16. 6 refs. [Chin.e.]

The alinement-chart method was found more rapid and convenient than the use of equations. *From author's summary.*

548. LIU, S.-H. **Studies on the increments of China Fir and Japanese Cryptomeria in different localities.** *Bull. Taiwan For. Res. Inst.* No. 24, 1950. pp. 40. 12 refs. [Chin.e.]

Stem analyses were made on 6 trees each (3 from each of 2 sites) of *Cunninghamia lanceolata* and *Cryptomeria japonica.* Details of position, soil and climate of the sites are given. Both species gave

good results at Fen-Ki-Hu, at an altitude of 1400 ft. *From author's summary.*

549. Liu, S.-H., and Yang, P.-L. **Studies on the increment of 3 species of Beefwood (*Casuarina* spp.).** *Bull. Taiwan For. Res. Inst.* No. 26, 1950. pp. 32. 14 refs. [Chin.e.]

Stem analyses were made on 6 sample trees of the species *C. equisetifolia*, *C. stricta* and *C. quadrivalvis*. Results, giving total height; d.b.h. and b.a. increments; total, current and mean annual increment, and increment % of volume; and an analysis of the variance of various periodic increments, are discussed and shown in graphs and tables.

550. Liu, S.-H., and Hung, L.-P. **Studies on the increment of Teak in coppice forest and of planted trees. (*Tectona grandis* L.).** *Bull. Taiwan For. Res. Inst.* No. 22, 1950. pp. 24. 14 refs. [Chin.e.]

Measurements were made at monthly intervals for 2 years on 2- to 3-year-old coppice from trees felled at 30 years, all but the strongest shoot being removed from each stump. Measurements of planted trees were made by stem analysis on 8 wind-thrown trees. Results are tabulated and discussed.

551. Herbignat, A. Accroissements annuels moyens de quelques types de peuplier en Belgique. **[Mean annual [girth] increment of some Poplars in Belgium.]** *Bull. Soc. for. Belg.* 59 (7), 1952 (335–7). [F.]

Gives preliminary data for several clones of *Populus serotina*, *P. deltoides* f. *virginiana*, *P. robusta*, *P. regenerata*, and *P. marilandica*.

552. **The extent and nature of the forests.** *Carib. For.* 13 (1), 1952 (3–6, 24–7). [E.Span.] (*Rep. U.S. trop. For. Exp. Sta.* 12, [1951?].)

A report on studies made in the Puerto Rico forests throughout 1951. Stand data taken from a 5-year record in the Tabonuco and Colorado forest types show that in the climax forest mortality offsets increment. Attempts to discover reasons for variations in growth of *Dacryodes excelsa* were largely unsuccessful. Measurements were made of growth of Sierra Palm (*Euterpe globosa*), a common weed tree in the mountain forests. Studies of 5-year plot records show that its growth is not as rapid as was supposed. Dominant trees appear to be slowest in growth, and the suppressed most rapid, probably because the dominants are very old. Growth rate was estimated from leaf-sheath scars on the stems.

561. *Increment in Height, Diameter, Basal Area, Form and Quality. Variations and Trends; Dendrochronology*

See also Nos. 174–7, 181–4.

553. Meyer H. A. and Nelson F. B. **Accuracy of forest growth determination based on the measurement of increment cores.** *Bull. Pa. agric. Exp. Sta.* No. 547, 1952. pp. 27. 5 refs.

The accuracy of such determinations was measured by results from independent sets of growth data. The errors of a growth determination were analysed to show how a single set of measurements can furnish all the data necessary for determining the accuracy of the calculated volume growth. The error of a growth determination was found to depend chiefly on the variation of diameter growth of the individual trees on the number of borings taken, and on the sampling error of the forest cruise. In 21 sets of increment borings taken from different forests in central Pennsylvania, the dispersion of diameter growth within diameter classes varied from 0·033 to 0·141 in., all but 2 values of the standard error of estimate of diameter growth of individual trees being smaller than 0·075 in. Assuming an average value of 0·050 for this measure of dispersion of diameter growth, the volume growth of a forest can be determined with satisfactory accuracy on the basis of 50 to 100 borings.

Since the standard error of a growth determination depends not only on the sampling error of the growth data, but also on the accuracy of the forest cruise, little can be gained by increasing the number of borings to more than 100, as long as the standard error of the cruise is larger than about 5%. A table gives the standard error of a growth determination for different values of the sampling error of the cruise and for different numbers of borings taken. Most of these standard errors are smaller than 10% of volume growth. *From authors' summary.*

554. Transtrom, H. L. **A large increment borer.** *Tree-ring Bull.* 19 (1), 1952 (1–4).

Describes (and illustrates) the design and handling of large instruments made by the Water and Power Dept., Los Angeles, to take a core $\frac{19}{32}$ in. in diameter and 19–64 in. long.

555. Dobbs, C. G. **A study of growth rings in trees. Part 2. A ring pattern in European Larch.** *Forestry* 25 (2), 1952 (104–25 + 4 plates). 5 refs.

Errors and difficulties in counting the rings on Larch butts in the Bristol region during a war-time survey led to an unsuccessful attempt to establish a pattern by the method of measuring ring-widths discussed in Part I [cf. *For. Abstr.* 13 (No. 1438)]. During this work it was found possible to recognize the ring sequences by means of the pattern of light and dark zones in the growth layers. Two sorts of zones of denser wood were distinguished: the annual band of summer wood ending on the autumn break, here called the 'autumn band', and additional zones having their outer margins within the annual increment, found in 41% of the rings examined, and here referred to as 'lines'. The width of the ring also was found to be of some help, although in plantation trees it is subject to great interference from the effects of competition and management. A high degree of certainty in recognition and dating of the rings was found possible with the aid of these characters, especially the 'lines', many of which were found with great regularity in the same locus in the ring sequence. A frequency diagram based upon 'line-plots' of 105 butts is presented, and four plates of photographs showing features of the pattern from different places. Examples are given and discussed of the differences in the pattern between different districts within about 50 miles of Bristol, between different sites in the same district, and between different trees on the same site. There were indications that 'line' frequency may tend to increase with the age and hardness of the rocks, provided suppression of the rings is not severe. Very young

trees have an exaggerated tendency to 'line' formation, and the pattern is best shown in Larch from about the sixth to the thirtieth year of growth. A few sections from other parts of Great Britain (Durham, Kent, North Wales) do not show the pattern in typical form although some features of it are present, and it seems likely that several regional patterns may cover the British Isles. If they have any common basis it must be looked for on very broad lines. The Bristol-region pattern in Japanese Larch resembles that in European, but the few sections of other conifers examined present a somewhat different picture. The chief value of the pattern is considered to be that it increases ease and accuracy in the identification of the annual ring, and some practical applications are suggested. *From author's summary.*

566. *Yield Tables and Their Construction*

556. Bistrup, C. Udjævning af stamtallet. **[Smoothing the curve of tree number/ha.]** *Dansk Skovforen. Tidsskr.* 36 (10), 1951 (521–30). [Dan.]

Using data from Danish yield tables for Beech, Oak and Norway Spruce, the author derives equations expressing that portion of the tree-number curve which covers stand development in the more valuable, older stages—subject to less variation in silvicultural treatment than the earlier stages. From the table data the ratio Sk = area/tree number and its square root are calculated, and the relationship between $\sqrt{Sk}$ for various ages and $\sqrt{Sk}$ for a standard age (80 years for Beech and Oak; 60 for Spruce) is examined, along with the statistical errors involved. The curve of $\sqrt{Sk}$/age is found to be approximately rectilinear, so that $\sqrt{Sk} = a + bA$ where A is age, a and b being constants, and S—the number of trees/ha $= \frac{10{,}000}{(a + bA)^2}$. In view of the known approximately rectilinear relationship between A and diameter (D) of the tree of mean b.a., this may be rewritten as $S = \frac{10{,}000}{(a_1 + b_1 D)^2}$ where a_1 and b_1 are new constants which can be found from the averages of a limited number of observations of diameter and tree number (method given) and used to find $\sqrt{Sk}$, whence S is calculated as $\left(\frac{1}{\sqrt{Sk}}\right)^2 \times 10{,}000$. Values so found for each species are compared with values given by the various yield tables used. The formula method is based on number of trees/ha. *after* the customary Danish thinnings.

58. SURVEYING AND MAPPING (INCLUDING AERIAL SURVEYS)

585/588. *Aerial Reconnaissance and Survey*

557. Cosma, D. Aerofotogrammetria forestale: stagione e ora della presa. **[Aerial photographs for forestry purposes: season and time of day at which they should be taken.]** *Monti e Boschi* 3 (5), 1952 (223–7). [It.f.e.]

With particular reference to Italian conditions.

558. Trorey, L. G. **Aerial survey in forest management in the Pacific Coast forest region [of British Columbia].** *Emp. For. Rev.* 31 (2), 1952 (99–102 + 4 photos). 2 refs.

Notes on cameras, scales, interpretation, mapping etc. adapted to local conditions.

559. **A guide to Pacific land forms and vegetation for use in photographic interpretation.** Bureau of Aeronautics, Navy Department, Washington. 1945 [reprinted 1950]. pp. 110.

Includes 298 photographs.

560. Aitken, J. D., and Hall, N. **A note on the interpretation of forest information from air photographs.** *Aust. For.* 15 (1), 1951 [1952] (9–16). 2 refs.

Means of securing standardization in photo interpretation for forest classifications are discussed. Stereograms are recommended for use in setting 'standards' of forest types, with a secondary use in assessing height classes. Density scales are suggested for use in denoting degree of stocking. Adaptation of these devices to Australian conditions is discussed. [Cf. *For. Abstr.* 9 (No. 1361, 2626).]

561. Gates, D. M., and Tantraporn, W. **The reflectivity of deciduous trees and herbaceous plants in the infrared to 25 microns.** *Science* 115 (2997), 1952 (613–6). [University of Denver, Colorado.]

Measurements of the reflectivity of leaves in the region of 1·0 to 25·0μ were made on a number of species including *Acer saccharinum*, *Populus* spp., *Quercus robur*, *Salix babylonica*, *Tilia americana* and *Ulmus americana*. Results showing the reflectivities of the leaves at (1) 60° and (2) 20° angle of incidence, expressed as percentages relative to mirror reflection as 100%, and the ratio of the reflectivity of the upper to the lower leaf surface, are tabulated. Reflectivities showed no abrupt changes for the different wavelengths but appeared to have a slight maximum in the region of 10μ. Tropical vegetation from greenhouses possessed greater reflectivities than the native flora. Reflectivity is generally small, being below 10% for an angle of incidence of 65° and below 5% for 20°. Reflection takes place mainly at the outer epidermal surface, $\frac{1}{6}$ or less being contributed by the epidermal-palisade boundary. The upper surface reflects more than the lower, old leaves more than young, and shade leaves more than sun leaves. For each of these the inverse is true in visible radiation. The structure of the leaf surface and the covering by the cuticle, governing the roughness or smoothness of the leaf surface, appear to determine the degree of reflection. There is no transmission of radiation by leaves in the infra-red beyond 1·0μ, but the transmissivity of the clear epidermis is 40% or more. [Cf. *For. Abstr.* 13 (No. 2353).]

61. FOREST MANAGEMENT: GENERAL, THEORY AND PRINCIPLES

See also Nos. 216–8, 222, 225, 228, 330, 541, 574.

562. WORLEY, D., and MEYER, H. A. **The structure of an uneven-aged White Pine/Hemlock/hardwood forest in Luzerne County, Pennsylvania.** *Res. Pap. Pa. St. For. Sch.* No. 14, 1951. pp. 1 + 3 tbls.

A 100% cruise was made of 47 acres of old mixed forest and the data indicate that in forests of this type, managed for sustained yield, volumes as high as 5000 cu. ft./acre could be maintained indefinitely. Although a smaller average growing stock would be more profitable, it is clear that the balanced structure of a mixed uneven-aged forest can contain much higher volumes/acre than is generally assumed possible.

563. MEYER, H. A., and KELLER, W. C. **The normal growing stock of upland Oak forests in Central Pennsylvania.** *Res. Pap. Pa. St. For. Sch.* No. 14, 1951. pp. 6.

Comparison of yield-table data with measurements of several balanced Oak forests indicates that for the production of Oak sawtimber on average and good sites, a balanced growing stock of at least 1800–2400 cu. ft./acre should be maintained in both even-aged and uneven-aged stands.

564. ECHEVERRÍA BALLARIN, I. La edad de corta final en el *Pinus radiata*. **[The age of the final felling in *P. radiata*.]** *Montes, Madrid* 8 (45), 1952 (185–7). [Span.]

Difficulties in importing Okoumé from Guinea have led to increasing use of *P. radiata* in northern Spain for plywood manufacture. Trials at the Instituto Forestal indicate that under Spanish conditions the greatest yield of large timber is to be obtained from stands managed on a 35- to 40-year rotation, with moderate 3-yearly thinnings, so as to avoid excessively dense stands. Excessive opening of the canopy resulted in a reduction in the volume of large timber.

62. WORKING PLANS. ANNUAL OR PERIODIC YIELD. YIELD REGULATION

See also No. 222.

565. BADRÉ, L. Évolution des aménagements des futaies résineuses dans l'Est de la France et plus spécialement dans le Haut-Rhin. **[Developments in the management of coniferous high forest in the east of France and particularly in the Haut-Rhin.]** *Rev. for. franç.* 1952 (7/8), (500–7). 2 refs. [F.]

When the forests of Alsace returned to France in 1918 they were managed for about 10 years on the uniform system with fixed periodic blocks. A change was then made to the floating periodic block, which was used for the next 10 years. Now, after the devastation of the war years has been partially made good, a system has been evolved which attempts to combine the merits and avoid the disadvantages of both fixed and floating periodic blocks. (1) A general inventory of the whole forest is made at each revision, with enumeration of all trees of 20 years and over. (2) Yield regulation is done separately (by volume), at each revision, (*a*) for the principal fellings in the regeneration block and (*b*) for improvement fellings in the rest of the forest. (3) The area of the regeneration block (*quartier bleu*) is reduced as far as possible, varying between 20 and 25% of the forest area. (4) If sufficient regeneration has not been obtained 8–10 years after the seeding felling, recourse is had to planting. (5) The rotation is often reduced to 100–120 years on poor sites, where it has been shown that growth of Silver Fir slows down at 100 years of age. (6) In accordance with (5), old, stagnant stands are systematically eliminated.

566. SCHAEFFER, L. Les revisions d'aménagements. **[Revisions of management plans.]** *Rev. for. franç.* 1952 (7/8), (507–12 + tbl.). 5 refs. [F.]

Discusses Badré's article [see preceding abstract] and stresses the importance of frequent revisions under the uniform system.

567. NOAKES, D. S. P. **A working plan for the Matang Mangrove forest reserve, Perak.** Forest Department, Federation of Malaya. 1952. pp. viii + 173 + 1 map + 17 photos + 5 gphs.

568. SANGSTER, R. G. **Buganda dedication scheme. Working plan for indigenous forests.** Government Printer, Uganda. 1951. pp. 17. (6th British Commonwealth Forestry Conference, Canada, 1952.)

Cf. *For. Abstr.* 14 (No. 907).

65. SPECIAL BUSINESS PROBLEMS OF TIMBER-GROWING. CALCULATION OF COSTS AND PROFITABILITY. VALUATION

See also Nos. 225, 229, 233, 237, 249, 305, 325, 340, 352, 361–2, 389, 443.

569. ŻABKO-POTOPOWICZ, A. Zagadnienie renty różniczkowej w leśnictwie. **[Problem of differential rental in forestry.]** *Sylwan* 96 (2), 1952 (129–37). 30 refs. [Pol.]

A discussion of the notion of differential soil rental as developed by Marx, Lenin, and a number of Soviet authors, with particular reference to forestry.

570. GRØN, A. H., and JØRGENSEN, F. **Calculation of sylvicultural balance-numbers.** *Nordisk Tidsskrift for Teknisk Økonomi* 12 (37), 1948 (123–31). 7 refs. [E.]

The Faustmann formula may be expressed in the form:—

$$C\left(1+\frac{1}{1.0\,p^{n}-1}\right)+\frac{e}{0.0p}+S \gtreqless \left(Y_{r}\times 1.0p^{-r}+\Sigma_{o}^{r}Ta\times 1.0p^{-a}\right)\times \left(1+\frac{1}{1.0p^{r}-1}\right)$$

and the value of p which equates the two sides is the financial yield or mean annual forest %.

The authors call the right-hand side of the equation, i.e. the receipt side (future receipts discounted to the time of formation of the stand), the *sylvicultural balance-number*, and have devised a rapid method of estimating its range of values for a given site quality of any species with a variety of thinning grades and price gradients. The current annual increment is graphed against age, and the volume removed as thinnings is expressed as a function of the increment. Price per cubic metre, which is related to diameter, can be graphed against age. By the use of semi-logarithmic graph paper, and by planimetering graphed areas, it is claimed that the time required to work out a series of results is greatly reduced.

571. JØRGENSEN, F. Skovøkonomiske beregninger: en grafisk beregningsmetode. **[Calculations in forest economics. [I:] A graphical method of calculation. [With introductory remarks by A. H. Grøn].]** *Dansk Skovforen. Tidsskr.* 34 (5), 1949 (173–94). 16 refs. [Dan.dan.]

Sets forth in greater mathematical detail the graphical methods of calculation developed in a previous paper [see preceding abstract] and illustrates their use for the calculations involved in finding 'balance-numbers', soil value and expectation value. The required data are curves for c.a.i., average annual fellings (thinnings), price as a function of mean diam. of the felled trees, diameters of the main crop and thinnings respectively, and curves or tables of the various interest factors. These can be used to curve 'balance numbers' and soil value as functions of rotation, and expectation value as a function of age of stand. The method avoids laborious arithmetical discountings and summations of thinning yields; it is well suited as an aid to comparative economic analyses since changes in management or price conditions are easy to express with the help of the basic graphical data; and the calculations are easier to follow in graphical form.

572. JØRGENSEN, F., and HERMANSEN, N. K. Skovøkonomiske beregninger II. Omdriftsbestemmelse. **[Calculations in forest economics. II: Determining the [financial] rotation.]** *Dansk Skovforen. Tidsskr.* 35 (7), 1950 (352–85). 11 refs. [Dan.]

Briefly reviews relevant literature and expounds the mathematical basis of, and graphical methods applicable to, the calculation of the rotation giving the maximum capital value of investment in a forest stand, starting from the formula: Capital value

$$= [Y_r \times 1{\cdot}0p^{-r} + \Sigma_o^r Ta \times 1{\cdot}0p^{-a}] - \left[C + (e + S \times 0{\cdot}0p)\frac{1{\cdot}0p^r - 1}{0{\cdot}0p \times 1{\cdot}0p^r}\right],$$

i.e. the sum of the discounted values of future receipts minus that of future expenditure. By differentiation it is found that the maximum capital value occurs when $P(r) \times [f(r) - 0{\cdot}0p \times M(r)] + M(r) \times P'(r) = e + 0{\cdot}0p \times S$ (where, in addition to the usual English symbols, $P(r)$, $f(r)$, $M(r)$, and $P'(r)$ are respectively net standing price, c.a.i., volume of growing stock, and price increment—all as functions of the rotation age r), i.e. when value increment, after its culmination, becomes equal to the sum of annual soil rental and annual charges. This is true provided that at this time the value increment is in fact declining. The age r that satisfies this equation is the most advantageous rotation, found graphically as the intersection of the curve of the right-hand side of the equation with the straight line representing the left-hand side. The demonstrations of the formulae above are based on the fixed rate of interest p, but it is shown that if this is replaced by a variable current forest % p_f, the last equation is satisfied by the equation of the curve of p_f in relation to r, and p_f

$$= \frac{f(r)}{M(r)} \times 100 + \frac{P'(r)}{P(r)} \times 100 - \frac{e + 0{\cdot}0p \times S}{Y_r} \times 100$$

an expression which proves to be equivalent to that for the indicating %. In all the calculations, soil rental is taken together with the annual charges as a fixed cost; this procedure is claimed to be appropriate in practice, since soil rental is really a cost entry against the standing crop. The remainder of the paper is devoted to discussion of the individual factors and their variations and to examples of procedure. The Danish symbols (which differ from the English) are listed in an appendix.

573. WORTHINGTON, F. P., and SHAW, E. W. **Cost of thinning young Douglas Fir.** *Timberman* 53 (10), 1952 (136–8).

A thinning study taking out 8-ft. logs with top diameter 7–14 in. was made on a fully stocked 50-year-old stand. Figures showing costs per bd. ft. and per cu. ft. for the different operations from felling to hauling to the sawmill, production/man hr., and skidding costs by log size and distance, are tabulated. Total costs and general overhead costs are well below the market price, and thinning young Douglas Fir stands for sawlogs is shown, therefore, to be possible and profitable.

574. WOBST, A. Werterzeugung und Wirtschaftserfolg beim Nadelholzbetrieb. **[The value production and successful management of conifers.]** Verlag Paul Parey, Berlin. 1948. pp. 132. 32 refs. [G.g.]

The work consists of two sections, dealing with: (1) Value production and increment (based on the average return per cu.m. timber of the final crop) for Pine and Spruce in relation to site, period of rotation and thinning grade for the former Prussian state forests 1925–32; and (2) the economic state of softwood production in 1940, and its improvement.

575. KRAHL-URBAN, J. Die maximale Wertholzleistungsfähigkeit in Eichenbeständen. **[Maximum yield of high-quality timber in Oak stands.]** *Forstwiss. Cbl.* 71 (5/6), 1952 (141–51). 5 refs. [G.g.]

Cf. *For. Abstr.* 12 (No. 3507).

66. COSTING OF LOGGING OPERATIONS

See also Nos. 367, 376, 378, 382–3.

576. SOOM, E. Rückaufwand und Wegabstand beim Rücken von Brennholz. **[Transport costs and the spacing of forest roads in relation to the extraction**

of fuelwood.] *Schweiz. Z. Forstw.* 103 (8), 1952 (279–87). [G.g.f.]

Cf. *For. Abstr.* 12 (No. 3537).

68. ADMINISTRATION AND ORGANIZATION OF FOREST ENTERPRISES

681. *National (Federal, State) Forest Services and Administration*

577. **[Short history of the organization of the Forest Service in Persia.]** *Yearbook of the Forestry Institute, Teheran, 1950–51*, 1951 (1–15). [Per.]

The Government's attention was first drawn to its forests ca. 1918, when a review of Customs accounts revealed the large profits made by foreign concessionaires from the export of Box, Oak and Walnut from the forests of the north. Following a 3-man survey party, which abortively attempted to map these forests and distinguish State forests from private, the Ministry of Agriculture in 1920 set up a second party, with similar but broader objectives. In 1923, with increased finances, the Ministry established their headquarters at Meshed and also appointed a German, Von Haken, as forestry expert. The latter got Government to agree to a special budget for the forests and to issue a decree (Motion No. 8451 of 1 March 1924) declaring (1) all forests to be state property unless private ownership could be legally established, (2) State supervision over all forests, however owned, (3) State regulation of all exploitation, (4) and (5) cutting and export of commercially valuable species (specified) only under strict regulation. A small, uniformed, forest cadre was appointed, with a headquarters staff of about 6 under Von Haken, plus field staff, each of one ranger and 3 forests guards, centred respectively at Bābalsar and Resht: a solitary ranger was also sent to the South coast, with the particular object of protecting certain young Sandalwood plantations. Besides enforcement of the Decree in his particular area, each guard was employed in mapping. When Von Haken left Persia in 1928, the organization was still of its original size, owing to lack of funds. In that year, a special forest officer was appointed to supervise the working of the northern forests and try out various methods of control. In 1931, following the visit to these forests of a French adviser, L. Niguet, the controlling staff was reorganized and 40 forest guards, trained at Government expense, were put in direct charge, to supervise a new system of restricted felling by licence. Government notification of April 1932 forbade *inter alia* clearances and charcoal burning in commercial forest, whatever its ownership. In 1938 a forest section was created at Teheran which soon grew into a separate Department of Forests (1941). Nurseries were established at 4 centres, and a small area chosen at Khajūr, between the Caspian and the Elburz mountains, as a trial management unit. In 1943 came the first Forest Act and arrangements for higher forestry training. In 1948 the young Department changed its designation to the Institute of Forests. Its subdepartments and sections, and the successive Heads are listed. [Cf. *For. Abstr.* 14 (Nos. 4, 890).]

578. MIGUEL, A. F. **Development of forest administration in the Philippines.** *Filipino For.* 3, 1951 (56–73).

686. *Planning and Organization of Buildings, Transport Installations (Roads etc., including Power-line Rights-of-Way)*

See No. 576.

687. *Planning and Organization of the Transport of Men, Supplies and Equipment*

579. **Air operations handbook. Part 3. Aerial cargo.** U.S. Forest Service, Washington, D.C. 1952. pp. iv + 57 + numerous photos, dgms.

[Cf. *For. Abstr.* 14 (Nos. 398–9).] Deals with all matters pertaining to air cargo transport, with particular reference to the dropping of supplies by parachute or other devices.

7. MARKETING. ECONOMICS OF TRANSPORT AND THE WOOD INDUSTRIES

See also Nos. 597–8, 902.

71. MARKETING OF FOREST PRODUCTS: GENERAL

580. WALLACE, A. F. *et al.* **Report and recommendations of a special committee set up to consider organised marketing and utilisation of timber grown in Scotland.** *Scot. For.* 6 (3), 1952 (90–6).

581. **Timber statistics, including market reports for January-December, 1950 and 1951.** *Quart. Bull. Timb. Statist. FAO* 4 (4), 1952. pp. 171. [E.F.]

72. THE QUANTITATIVE ASPECTS OF MARKETING. DEMAND, CONSUMPTION AND SUPPLY

582. **Lumber production and mill stocks 1950.** *Facts for Industry, U. S. Bureau of the Census, Washington, D.C.* No. *M*13G–00, 1952. pp. 8.

583. WALTERS, C. S. **Hardwood requirements of the Illinois coal-mining industry.** *Bull. Ill. agric. Exp. Sta.* No. 554, 1952 (499–551). 13 refs.

Gives data from 91 mines of their timber consumption during 1948, and of wood preservation and re-use, with information on standardization of mine-timber sizes, procurement, supplies, and estimated future requirements.

584. CRUIKSHANK, J. W. **1951 pulpwood production in the south.** *For. Surv. Release Stheast. For. Exp. Sta.* No. 38, 1952. pp. 28. 1 gph.

Results of a survey are tabulated showing production by state and species group, by state and survey unit and for the different states by county and species group.

585. Skogstillgångarna och industriens råvaruförsörjning. **[Forest supplies and the maintenance of raw materials to industry.]** *Svensk Trävarutidn.* 1952 (9), (537 . . 541). [Sw.]

Gives figures of supply and demand for timber for different districts of Sweden.

586. Trävarumarknaden 1950. **[The timber market in 1950.]** *Svensk Trävarutidn.* 67 (24½), 1951 (35 . . . 51). [Sw.E.]

An account of the international market and of the Swedish sawmill industry and its markets.

587. Plywoodmarknaden 1950. **[The [Swedish] plywood market in 1950.]** *Svensk Trävarutidn.* 67 (24½), 1951 (55 . . . 60). [Sw.E.]

588. Träförädlingsprodukter under 1951. **[Manufactured timber products in 1951.]** *Skogen* 39 (4*), 1952 (39*). [Sw.]

Reviews the markets in plywood, wallboards and prefabricated wooden houses and gives some figures for quantity and value of exports.

589. Skogsprodukternas avsättningsmarknader. **[Sales of forest products.]** *Skogen* 39 (6), 1952 (136, 143). [Sw.]

Gives figures of values and quantities of Swedish exports for 1951 of timber, wallboard, mechanical and chemical pulp and paper.

590. **[Exports from Sweden in 1950.]** *Svensk Trävarutidn.* 67 (24½), 1951 (125–6). [E.]

Tabulates figures showing exports of sawn and planed softwood, squared and round softwood, wood pulp and paper.

591. Pappersmassemarknaden 1950. **[The wood pulp market in 1950.]** *Svensk Trävarutidn.* 67 (24½), 1951 (81 . . . 98). [Sw.E.]

592. Wallboardmarknaden 1950. **[The [Swedish] wallboard market in 1950.]** *Svensk Trävarutidn.* 67 (24½), 1951 (63 . . . 71). [Sw.G.]

593. Tjärmarknaden 1950. **[The [wood] tar market in 1950.]** *Svensk Trävarutidn.* 67 (24½), 1951 (52–3). [Sw.E.]

Gives figures for Swedish exports.

594. Datos estadísticos de la producción, importación y exportación de maderas y productos forestales, correspondientes a los años 1943 a 1950. **[Production statistics, imports and exports of timber and other forest products for the years 1943–1950.]** Inspección General Forestal, Ministerio de Agricultura, Lima. 1951. pp. 60. [Span.]

79. ECONOMICS OF THE WOOD INDUSTRIES

595. ASPLUND, G. Något om wallboardindustriens utveckling och geografiska lokalisering. **[The development and geographical location of the wallboard industry.]** *Svensk PappTidn.* 55 (15), 1952 (505–14). [Sw.e.] P.R.

Gives details of the present world output, the growth of the industry since 1922, some new mills, and production, consumption and foreign trade by countries.

8. FOREST PRODUCTS AND THEIR UTILIZATION

See also No. 1.

596. **Forest products research.** *Timber of Canada* 12 (12), 1952 (20–35, 72).

An account of discussions and papers on timber mechanics, sawmilling, seasoning, veneer and plywood, and preservation, at the pre-conference meeting of the British Commonwealth Forestry Conference.

597. **Timber: American forest operations and increase of European productivity.** O.E.E.C., Paris. 1952. pp. 213 + 76 photos, 10 dgms. Many refs.

Reports of part of the O.E.E.C. mission to America, dealing with (1) logging, (2) sawmills, (3) plywood and veneer, (4) utilization of inferior and waste wood, and (5) grading and marketing.

598. HESS, R. W. **The possibilities of tropical hardwood production.** *Proc. U. S. For Prod. Res. Soc.* 5, 1951 (36–47).

A general discussion of the problems involved in the exploitation, utilization and marketing of timber under tropical conditions.

599. RODGER, A., and ALLSOP, F. **A handbook of the forest products of Burma.** Superintendent, Government Printing, Rangoon. 1951. pp. 144 + xv. Price *Rs.*10.

A reprint of the 1936 edition, with prices to 1934.

81. WOOD AND BARK: STRUCTURE AND PROPERTIES

600. BROWN, H. P., PANSHIN, A. J., and FORSAITH, C. C. **Textbook of wood technology. Volume II. The physical, mechanical, and chemical properties of the commercial woods of the United States.** McGraw-Hill Book Company, Inc., New York. 1952. pp. xvii + 783. 254 refs. Price £4. 5*s.*

For Vol. 1, cf. *For. Abstr.* 10 (No. 2598).

601. WILLIAMS, E. J. **Applications of component analysis to the study of properties of timber.** *Aust. J. appl. Sci.* 3 (2), 1952 (101–18). 7 refs. P.R.

Describes how the different components of variability in properties of timber may be distinguished and their magnitude assessed. The variation that occurs between different trees can be separated from that within the tree, and that between species from that between different trees of the same species. The need is indicated for this type of analysis in arriving at valid standard errors for average of properties and in making significance tests of differences among experimental results. Component analysis is also important as a guide to sampling, and methods of improving the efficiency of sampling by its use are described. *From author's summary.* [Cf. *For. Abstr.* 14 (Nos. 809, 814).]

810. *General Information on Woods*

See also Nos. 114, 719–21, 880.

602. WANGAARD, F. F., and MUSCHLER, A. F. **Properties and uses of tropical woods, III.** *Trop. Woods* No. 98, 1952 (1–190 + 6 plates).

Cf. *For. Abstr.* 12 (No. 2965); 14 (No. 634).

603. BRUCE, H. D., COCKRELL, R. A., and CUMMINGS, L. J. **Properties and uses of commercially important Japanese woods.** *Rep. nat. Resour. Sect., G.H.Q., S.C.A.P., Tokyo* No. 147, 1951. pp. 71. 12 refs. P.R.

604. THOMAS, A. V. **Malayan timbers: Durian [*Durio oxleyanus*] and Bengang [*Neesia altissima*].** *Malay. Forester* 15 (3), 1952 (146–9).

605. MICHELSON, A. Trois essences intéressantes du Kivu. **[Three interesting species from Kivu.]** *Études for. Com. nat. Kivu* No. 2, 1952. pp. 66 + 3 plates + 3 tbls. [F.]

Silvicultural characters, regeneration, and wood properties of *Beilschmiedia oblongifolia, Parinari* sp., and *Carapa grandiflora.*

606. SOUSA, A. DE F. GOMES E. **Dendrology of Mozambique. 1. Some commercial timbers.** Imprensa nacional de Moçambique. 1952. pp. 248 + 48 photos, 38 drawings. 23 refs. [E.] Transl. by A. de P. Bartolomeu from *Moçambique* No. 64, 1951.

Gives notes on some 50 species, including a brief account of their timbers.

607. **British Guiana timbers.** *Leafl. For. Dep. Brit. Guiana* Nos. 1–13, 1951.

A series of leaflets of 2–4 pages each, giving for each species general description, habitat, stocking and distribution of the tree, and general description, physical, mechanical, seasoning and working properties of the wood, its uses, and availability of supplies. The species covered are: Crabwood (*Carapa guianensis*), Greenheart (*Ocotea rodiaei*), Wallaba (*Eperua* spp.), Purpleheart (*Peltogyne* spp.), Mora (*Mora excelsa*), Cedar (*Cedrela odorata*), Determa (*Ocotea rubra*), Kabukalli (*Goupia glabra*), Locust (*Hymenaea courbaril* and *H. davisii*), Brown Silverballi (*Licaria canella*), Kereti Silverballi (*Ocotea wachenheimii*), White Silverballi (*O. canaliculata*), and Yellow Silverballi (*Aniba ovalifolia*).

608. **Specimen woods Nos. 198–200.** *Suppls.* to *Wood* 17 (6; 7; 8), 1952 (225–6; 267–8; 307–8).

Punah (*Tetramerista glabra*); Jelutong (*Dyera costulata*); and Kempas (*Koompassia malaccensis*).

609. **Foreign woods.** *Wood, Chicago* 57 (6), 1952 (68–71). P.R.

Quaruba (*Vochysia*, 2 species); Flor Azul (*Vitex kuylenii*); Rajate Bien (*Vitex cooperi*); and Sangre (*Pterocarpus vernalis*).

610. WARD, W. C., revised by REID, J. S. **The properties and uses of Rimu (*Dacrydium cupressinum*).** *Inform. Ser. N.Z. For. Serv.* No. 2, 1949. pp. 7.

Cf. *For. Abstr.* 13 (No. 2389).

611. GARDNER, C. A. **Trees of Western Australia. 3 and 4. Tuart and Illyarrie.** *Leafl. Dep. Agric. W. Aust.* No. 1096, 1952. pp. 8.

Descriptions of *Eucalyptus gomphocephala* and *E. erythrocorys.*

612. **Blackbutt.** *Tech. Notes For. Comm.* (*Div. Wood Technol.*) *N.S.W.* 5 (3), 1951 (3–7).

Describes the timber of *Eucalyptus pilularis*, its uses, properties and seasoning qualities, with notes on its distribution and a brief botanical description.

613. KEYLWERTH, R. **Iroko. [*Chlorophora excelsa.*]** *Holz Roh- u. Werkstoff* 10 (5), 1952 (225–6). 11 refs. [G.] P.R.

811. *Structure, Identification*

614. JOHNSTON, D. R. **Structure drawings to 'Specimen woods'. Sheets 12–14.** *Wood* 17 (6; 7; 8), 1952 (224; 266; 309).

(12) Rock Maple (*Acer saccharum*), Red Lauan (*Shorea negroensis*), Amboyna (*Pterocarpus indicus*), and American Black Walnut (*Juglans nigra*). (13) Guarea (*Guarea thompsonii*), Willow (*Salix alba*), Avodiré (*Turraeanthus africanus*) and New Zealand Kauri (*Agathis australis*). (14) Beech (*Fagus sylvatica*), Prima Vera (*Cybistax* (*Tabebuia*) *donell-smithii*), Iroko (*Chlorophora excelsa*), and Gurjun (*Dipterocarpus turbinatus*).

615. RAPOSO, F. Estrutura e identificação das madeiras das resinosas cultivadas em Portugal (caracteres microscópicos). **[Structure and identification of the wood of coniferous species cultivated in Portugal (microscopic characters).]** *An. Inst. Agron.*,

Lisboa 18, 1951 (117–70 + 1 plate + 1 tbl.). 32 refs. [Port.]

This first contribution to a series of studies of species economically important to Portugal contains a preliminary section on the anatomical characters used in describing and identifying coniferous woods, with tabulated data and short anatomical descriptions of the wood of 30 species.

616. **Identification of hardwoods: a lens key.** *Bull. For. Prod. Res., Lond.* No. 25, 1952. pp. 121 + 38 photos. 49 refs. Price 5*s*.

Includes descriptions of anatomical and other easily observed diagnostic features of nearly 400 hardwoods, set out in a convenient form for recording on marginally perforated index cards. Identification is carried out by sorting the pack of prepared cards according to the features observed in the sample to be identified. Definitions, explanatory notes and photo-micrographs of the features employed are given, with a select bibliography on identification. A combined check-list and index of common and botanical names is appended. *From author's abstract.*

617. **Photographs of Malayan timbers.** [Timber Research Laboratory, Sentul?] 1952.

Photomicrographs of 40 species with short notes on characters for identification.

618. Hall, J. W. **The comparative anatomy and phylogeny of the Betulaceae.** *Bot. Gaz.* 113 (3), 1952 (235–70). 87 refs. O.B.D.

A study is made of the wood anatomy of the 6 genera, *Alnus*, *Betula*, *Corylus*, *Ostryopsis*, *Carpinus* and *Ostrya*, and of the 2 tribes (Betuleae and Coryleae) to which these genera belong; and an attempt is made to establish the phylogenetic position of the family. The Coryleae show greater specialization than the Betuleae, which are regarded as the more primitive.

619. Kobayashi, Y. **Identification of Japanese Alder woods. 1. The properties of wood rays.** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 52, 1952 (181–97). 9 refs. [Jap.e.]

A study of different species showed that Miyamahannoki (*A. maximowiczii*), Miyamayashabushi (*A. firma* var. *hirtella*), Obayashabushi (*A. sieboldiana*) and Yashabushi (*A. firma*) do not have the aggregate rays considered characteristic of the genus. Only Himeyashabushi (*A. pendula*) of the Yashabushi group has aggregate rays. The frequent occurrence of biseriate rays in the Yashabushi group may be of use in identification. Heterogeneous rays are sometimes found among the homogeneous ones. *From author's summary.*

620. Stern, W. L. **The comparative anatomy of the xylem and the phylogeny of the Julianiaceae.** *Amer. J. Bot.* 39 (3), 1952 (220–9). 60 refs. O.B.D.

The wood of the Julianiaceae shows little variation from species to species, and does not support the contention that two genera should be recognized. The author suggests that the family should be placed in the complex which consists of two groups of families, one more highly evolved, according to the evidence of wood characters, viz. the Meliaceae, Simarubaceae and Rutaceae, and a second more primitive group consisting of the Burseraceae, Anacardiaceae and Julianiaceae.

621. Metcalfe, C. R. ***Medusandra richardsiana* Brenan. Anatomy of the leaf, stem and wood.** *Kew Bull.* 1952 (2), (237–44). 2 refs.

[Cf. *For. Abstr.* 14 (No. 140).] Includes a discussion of the taxonomy and phylogeny of the species.

622. Holdheide, W., and Huber, B. Ähnlichkeiten und Unterschiede im Feinbau von Holz und Rinde. **[Similarities and differences in the fine structure of wood and bark.]** *Holz Roh- u. Werkstoff* 10 (7), 1952 (263–8). 13 refs. [G.g.] P.R.

The similarities and differences in structure and development are illustrated by photomicrographs.

811.1. Anatomical Elements and Tissues

See also Nos. 181–4, 631, 827, 835.

623. Wardrop, A. B., and Dadswell, H. E. **Cell wall studies in relation to pulp and paper research.** *Proc. Aust. Pulp Pap. Ind. tech. Ass.* 5, 1951 (204–25). 49 refs. Smry. (Also as *Repr. For. Prod. Aust.* No. 151.)

The fundamental wood structure of the various constituent cells of wood has been reviewed and new information presented on the micellar spiral organization in medullary ray and vertical parenchyma cells. In these cells the micellar spiral angle has been shown to be 40 to 50°. The relation between wall structure and fibre properties has been discussed and some new techniques for examining fibre surfaces described. The importance in pulp and paper research of the changes to the fibre surface before and during bonding has been stressed. *Authors' summary.*

624. Wardrop, A. B., and Dadswell, H. E. **The cell wall structure of xylem parenchyma.** *Repr.* from *Aust. J. sci. Res. 5B* (2), 1952 (223–36 + 23 photos). 27 refs.

The fine structure of the cell wall of both ray and vertical parenchyma has been investigated. In all species examined secondary thickening had occurred. In the primary cell wall the micellar orientation was approximately transverse to the longitudinal cell axis. Using optical and X-ray methods, the secondary cell wall was shown to possess a helical micellar organization, the micelles being inclined between 30° and 60° to the longitudinal cell axis. The distribution of the various cell-wall constituents was studied, and it was observed that most of the lignin occurred in the intercellular layer and primary wall. The layered structure of the cell wall of sclerosed parenchyma cells was also investigated and it was demonstrated that these cell walls possess both structural and chemical heterogeneity. *Authors' summary.*

625. Wardrop, A. B. **The low-angle scattering of X-rays by conifer tracheids.** *Textile Research Journal, Lancaster, Pa.* 22 (4), 1952 (288–91). 16 refs. L.S.

The low-angle scattering diagram of wood presents certain features not present in those of textile fibres studied by other authors. Low- and wide-angle diffraction diagrams have been obtained of wood specimens taken from successive growth rings of a cross-section of a *Pinus taeda* stem. Attempts at interpreting some features of the low-angle scattering diagrams may be summarized as follows: the middle layer makes the major contribution to the X-ray diagram; the low-angle scattering diagram of a block of cambium cell is only a diffuse halo surrounding the central spot; hence the meridional streaks observed are supposed to arise from the outer and inner layers of the secondary wall.

626. PRESTON, R. D., and SINGH, K. **The fine structure of Bamboo fibres. II. Refractive indices and wall density.** *J. exp. Bot.* 3 (8), 1952 (162–9). 8 refs. [University of Leeds.] O.B.D.

[Cf. *For. Abstr.* 12 (No. 1162).] In the fibres of *Dendrocalamus strictus* and *D. longispathus* it has been shown that the refractive indices of the outer wall lamella parallel and perpendicular to cell length, are correlated not only with cell length, but also with the density of the whole wall. The indications nevertheless are still that the variation in refractive indices with cell length are due mainly to changes in the orientation of the cellulose microfibrils. There is, however, a subsidiary effect of factors associated with density. These factors are briefly discussed. *Authors' summary.*

627. MESSERI, A. Anomalie nella differenziazione del legno in rami di olivo defoliati a varie epochi. **[Abnormal wood formation by Olive branches defoliated at different dates.]** *Nuovo G. bot. ital.* (*n.s.*) 58 (2), 1951 (337–54 + 5 photos). 6 refs. [It.it.e.] A.P.B.

Branches of an Olive tree were defoliated on 12 December 1949, 25 January, 5 March and 29 March 1950, and others left as controls. All defoliated branches formed abnormal wood during 1950, and the abnormalities are described in detail. Analysis of the results leads to the conclusion that the mature (1-year-old) leaves of the Olive have a special function in controlling the formation of secondary wood, probably by accumulating some growth substance during the winter, which is available at the beginning of the vegetative period.

628. BISSET, I. J. W., DADSWELL, H. E., and WARDROP, A. B. **Factors influencing tracheid length in conifer stems.** *Aust. For.* 15 (1), 1951 [1952], (17–30 + 2 photos). 21 refs.

Because of the practical significance of tracheid length in the pulp and paper industry and of its correlation with properties, the variation of this feature within and between stems of certain species of *Pinus* has been investigated. The tracheid length has been related to the rate of radial growth of the stem and, in general, within any one stem, it has been found that a wider growth ring has a low average tracheid length and a narrow growth ring a high average tracheid length. Some evidence was obtained of a similar correlation between stems. Trees with an initial high tracheid length maintained this characteristic through growth rings subsequently formed. Reasons for the variation in initial tracheid length are unknown, but in *Pinus pinaster* it appeared to have some relation to the 'strain' of the species. Possible means by which stems of high initial tracheid length may be obtained [including vegetative propagation from favourable trees] are discussed. *Authors' summary.*

629. HATA, K. **Studies on the pulp of Akamatsu (*Pinus densiflora* Sieb. et Zucc.). (I) On the length, diameter, and length-diameter ratio of tracheids in Akamatsu wood.** *Tech. Bull. Kawaga-Ken agric. Coll.* 1 (1), 1949 (1–35). 15 refs. [Jap.jap.e.] A.P.B.

Measurements were made of tracheid length and diameter in 5 trees. Results are shown in graphs and tables. The following are the main conclusions: (1) In cross-sections of stems and branches, tracheid length at first increases from the centre outwards, reaches a maximum, and then remains constant. (2) Tracheid length varies inversely with annual-ring breadth. (3) In a given growth ring, tracheid length at first increases with height in the tree, reaches a maximum and then decreases. (4) The length of tracheids in the annual ring nearest the pith increases with height up to 1·5–3 m. above the ground and then remains constant or varies irregularly. (5) Tracheids of the stem are longer than those of the branches, and those of thick than of thin branches. (6) Longer tracheids are found in fast than in slow growing trees. (7) Variations in tracheid diameter and length/diameter ratio correspond with those in tracheid length. (8) In a given annual ring, maximum tracheid diameter is found nearer the ground than maximum tracheid length. In a cross section of the stem and branches the annual ring in which tracheid diameter reaches a maximum is nearer the centre than that in which tracheid length reaches a maximum. (9) An inverse relationship was found between the summerwood in annual rings and tracheid diameter and between annual ring breadth and the length/diameter ratio of tracheids.

630. PILLOW, M. Y. **Length of fibres in certain Yucatan hardwoods.** *Tappi* 35 (5), 1952 (238–40). P.R.

The average length of wood fibres determined in 13 Yucatan hardwoods varied from 0·69 to 1·67 mm. in the different species. This range is about the same as that of certain hardwoods used for pulp in the United States. Wood fibres of the Yucatan species consisted mostly of libriform fibres, but a few fibre-tracheids were present in some species. Fibre-tracheids are distinguished by small, bordered pits instead of the simple pits that are characteristic of libriform fibres. Septate fibres were found only in the species Jujub [*Spondias mombin*]. It is not practical to determine a unique average length of fibres for each of the Yucatan hardwoods. Reasonable estimates were made, however, for their classification by fibre length and for statistical evaluation of variability of fibre length, so that the range of average fibre lengths for each species can be predicted at a 95% level of probability. *Author's summary.*

811.2. Special Features and Abnormal Structure

See also Nos. 647, 664.

631. **Cell division in the cambium—the formation of compression wood.** *Rep. Commonw. sci. industr. Res. Organ. Aust. 1950/51,* 1951 (84).

It has been shown that the formation of compression wood in conifer stems involves an increase in the number of anticlinal divisions of the fusiform initials, resulting in a decrease in the average tracheid length. Similar observations have been made in stems where there has been a sudden change from narrow to wide growth rings. The results demonstrate that at least some of the undesirable properties of compression wood arise from the changed growth rate that accompanies its formation, because the increased rate of radial growth through the accompanying changes in cell length, influences micellar organization in the cell walls, and thus wood properties. [Cf. *For. Abstr.* 13 (No. 2411).]

811.4. Growth Rings. Early and Late Wood

See also Nos. 181–4, 555, 646.

632. NYLINDER, P. Beräkning av höstvedhalt och medelårsringbredd. **[The calculation of the content of summerwood and of the average breadth of annual rings.]** *Medd. SkogsforsknInst., Stockh.* 40 (10), [1951]. pp. 40. [Sw.sw.e.] Price *Kr.*2.

Some theoretical methods of determining summerwood content, mean annual-ring breadth, and their mean variation are discussed. Correction factors are also given. The methods were compared with actual measurements on 100 increment cores; results are tabulated. The best results for both summerwood content and annual-ring breadth were obtained from a method in which the radius is divided into a number (5–10) of equal parts. The linear summerwood content in each such part is then adjusted by a correction factor, obtained from tables. The summerwood content of the cross-section is then obtained by balancing the summerwood contents of each 'circle ring' (obtained from the radial divisions) against the ring's surface area relative to the total surface area. The mean annual-ring breadth is obtained by balancing the linear breadth of annual ring (obtained by dividing the sum of the breadths of all annual rings in the 'circle ring' by the number of annual rings in the 'circle ring') of each 'circle ring' against its relative surface area.

633. YOUNG, H. E. **Differential time of change from earlywood to latewood along the bole of young Loblolly Pine trees.** *J. For.* 50 (8), 1952 (614–5). 5 refs.

Four 14- and 15-year-old *Pinus taeda* trees were felled, and sections removed at ground level, breast height, 50%, 65%, and 80% of total height. Measurements were made of the early and late wood of each annual ring on the average radius of each section. For the current year, the % of late wood decreases from the ground level to the tip. The inception of late wood seems to begin at ground level in June and gradually appears up the bole until it occurs near the tip in early September At any given level on the stem, the % of late wood in the annual ring increases from the pith towards the cambium It is suggested that since the terms spring and summer wood or early and late wood have little meaning, they should be replaced by the terms region of large cell formation and region of small cell formation *From author's summary*

812. *Physical and Mechanical Properties*

See also Nos. 176, 600, 789.

634. WANGAARD, F. F. **Tests and properties of tropical woods.** *Proc. U.S. For. Prod. Res. Soc.* 5, 1951 (206–14). 7 refs.

Discusses the contribution of studies on tropical woods to fundamental knowledge of wood properties, and outlines methods used to evaluate tropical woods for possible uses. Particular attention is paid to comparisons of strength and other properties of tropical and U.S. temperate woods. It is suggested that some departures in tropical woods from the sp. gr./moisture-content relationships that might be expected from those of U.S. species, may be explained in part by a lower fibre-saturation point in most of the tropical species tested, though definite proof of this has still to come. A 'species profile' method is suggested for presenting graphically a comparison of the relevant properties of a given wood for a particular use with those of a species whose suitability for that use is known. [Cf. *For. Abstr.* 14 (No. 602).]

635. ENTRICAN, A. R., WARD, W. C., and REID, J. S. **The physical and mechanical properties of the principal indigenous woods of New Zealand.** New Zealand Forest Service, Wellington. 1951. pp. 83 + 1 photo. 22 refs.

Presents the results of more than 40,000 tests on wood of 9 softwood and 16 hardwood species. Data of 23 well known commercial species from other countries are given for purposes of comparison.

636. ŠIMANJUK, A. P., and PERELYGIN, L. M. Možževeljnik obyknovennyĭ: èkologo-lesovodstvennaja harakteristika i fiziko-mehaničeskie svoĭstva drevesiny. **[*Juniperus communis*: ecological and silvicultural characters, and physical and mechanical properties of the wood.]** *Dokl. Akad. Nauk SSSR* 67 (5), 1949 (917–20). 6 refs. [Russ.] A.P.B.

Very brief notes on the tree form of the Juniper and its distribution in Russia, growth, and size attained, are followed by data from physical and mechanical tests of the wood, made on samples from a single butt log from a 97-year-old tree, 10·75 m. high and 19 cm. diam. at 10 cm. from ground level, in Kostroma. Important wood properties are compared in a table with those of *Picea orientalis*, *Pinus sibirica*, *Juniperus excelsa* and *J. virginiana*. It is concluded that *J. communis* could be as good a pencil wood as *J. virginiana* (even better in its lower shrinkage and hardness values) and better than *P. sibirica*, the chief species used for pencils in the U.S.S.R.

637. VIHROV, V. E. Fiziko-mehaničeskie svoĭstva drevesiny vjaza. **[Physical and mechanical properties of the wood of *Ulmus laevis*.]** *Dokl. Akad. Nauk SSSR* 65 (1), 1949 (101–4). 3 refs. [Russ.] A.P.B.

812.1. Optical, Acoustic, Frictional, Thermal and Electrical Properties

See also Nos. 693, 734, 742, 842.

638. **Thermal expansion.** *Rep. Commonw. sci. industr. Res. Organ. Aust. 1950/51*, 1951 (84).

It has been shown that changes in this property occur in successive growth rings from the pith outwards in conifer stems. Variations have been investigated in normal stems, in stems containing compression wood, and in stems that have undergone considerable changes in growth rate. Both shrinkage and thermal expansion depend on the cell-wall organization and vary with changes in cell length.

639. Lawson, D. I., Webster, C. T., and Ashton, L. A. **Fire endurance of timber beams and floors.** *National Building Studies Bulletin* No. 3, 1951. pp. 8 + 2 photos. Price 1*s*. P.R.

Summarizes the results of tests begun in 1945–6 on timber floors of different constructions, the fire endurance being measured according to British Standard 476. Depth of charring of timber beams is represented by a graph as a function of the test duration. The fire endurance (dependence of the ratio of applied load to breaking load upon the time of collapse) of various sizes of timber beams is graphed. Actual test results are compared with the fire-endurance values calculated by means of a formula.

640. **Timber for fuel.** *Malay. Forester* 15 (3), 1952 (150–2).

In order to assess the value of some Malayan woods for fuel, a simple test was carried out by placing a fixed quantity of fuel (1·33 cu. ft.) in a fire-box, lighting it, and then measuring the increase in temperature of a fixed quantity of water placed in a tank on top of the fire-box. Notes were made of ease of splitting, ease of ignition and burning, and quantity of smoke produced. The tests were not very accurately controlled, but the results were very consistent. The following conclusions are drawn. *Eucalyptus alba* is the most suitable of the Eucalypts tested (*E. alba*, *E. deglupta*, *E. robusta*). Batai (*Albizzia falcata*) is presumably not very popular, as it burns very fast and leaves rather more ash than the other timbers. Yemane (*Gmelina arborea*) burns fairly fast and gives off a lot of smoke. Rengas (*Melanorrhoea torquata*), Mata Ulat (*Lophopetalum* spp.) and Ru (*Casuarina equisetifolia*) transmitted less heat than the other species. Rengas gave off a lot of smoke, but Mata Ulat and Ru burned well without a great deal of smoke. Meranti (*Shorea* spp.) and Durian (*Durio oxleyanus*) should be popular.

641. Kröner, K., and Pungs, L. Zur dielektrischen Anisotropie des Naturholzes im grossen Frequenzbereich. **[Dielectric anisotropy of natural wood over a wide range of frequencies.]** *Holzforschung* 6 (1), 1952 (13–6). 7 refs. [G.g.e.] P.R.

Measurements of the dielectric constant in the frequency range of 3×10^2 to 10^9 c./s. were carried out to determine the dielectric anisotropy of Spruce, Beech, and Oak wood in kiln-dry condition. The anisotropy found is mainly due to the macroscopic structure of wood presenting a complex of cellular structure and air.

812.2. Behaviour with Liquids and Gases. Moisture Relations etc.

See also Nos. 757, 797–8.

642. Danilov, M. D. O vlažnosti drevesiny v stvole duba v svjazi s vozrastom dereva. **[The wood moisture content of Oak stems in relation to age of tree.]** *Dokl. Akad. Nauk SSSR* 67 (6), 1949 (1139–42). [Russ.] A.P.B.

Details the results of measurements on freshly felled sample trees in pure Oak stands of ages 5–7 to 250 years, in August–September. Moisture content varied rather widely with height up the stem but it was difficult to see any regular relationship except that in young stands (7–40 years) moisture tended to increase, and in older ones to decrease, up the stem. The relative moisture contents of heartwood and sapwood differed with age, the heartwood being the moister up to ca. 60 years, and the sapwood thereafter, but the absolute differences were not great. There was, however, a regular change with age in the moisture content in both types of wood: up to 130 years the moisture content of both showed a steady increase, but at 250 years old the moisture had dropped approximately to that of the 20-year-old trees. This effect, which is thought to be connected with differences in the development of the root system at different ages, was most apparent in sections cut at butt and at $\frac{1}{2}$ tree height; in the crown portion it was less marked.

643. Smith, W. R., and Goebel, N. B. **The moisture content of green Hickory.** *J. For.* 50 (8), 1952 (616–8). 2 refs.

Study of trees of a number of *Carya* spp. (*C. aquatica*, *C. cordiformis*, *C. glabra*, *C. ovalis*, *C. ovata*, *C. pallida*, *C. tomentosa*) showed that average moisture content of sapwood was 51% and that of heartwood 70%. There was no appreciable difference between species and no significant monthly trend in moisture content during the year. The seasoning implications of this peculiarity are discussed.

644. **Moisture content changes in seasoned lumber in storage and transit.** *Bull. For. Br. Can.* No. 102, 1952. pp. 16 + 3 photos.

Summarizes the results of studies made and published between 1931 and 1937 at the Vancouver Forest Products Laboratory and now out of print, and gives some additional data derived from subsequent research. (1) Change in moisture content of lumber in storage. (2) Change in moisture equilibrium of kiln-dried and air-dried lumber. (3) Change in moisture content of lumber when shipped by rail. (4) Change in moisture content of lumber during ocean shipment. (5) Absorption of moisture by lumber in British Columbia.

645. Kühne, H., and Vodoz, J. Über das Schwinden und Quellen einiger schweizerischer Hölzer. **[Shrinkage and swelling of some Swiss woods.]** *Bericht, Eidgenössische Materialprüfungs- und Versuchsanstalt für Industrie, Bauwesen und*

Gewerbe, Zürich No. 179, 1951 (29–44). 76 refs. [G.f.e.] P.R.

Presents results of tests on the shrinkage of *Picea abies, Abies alba, Larix decidua, Fagus sylvatica, Quercus robur* and *Q. sessiliflora*, made on small clear specimens, special consideration being given to influence of density, differences between sapwood and heartwood of Larch, and determination of values between the fibre-saturation and oven-dry conditions. Different test methods may give divergent values for shrinkage parallel to grain.

812.3. Density. Specific Gravity. Buoyancy

See also Nos. 719, 721, 827.

646. KANO, T. **Forest biological studies on wood quality. (Report 3). On the variation in the width of annual rings, summer-wood per cent and bulk density of green Todo Fir [*Abies mayriana*] grown in the Nopporo district of Hokkaido.** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 52, 1952 (23–51). 17 refs. [Jap.e.]

[Cf. *For. Abstr.* 13 (No. 1506).] Results are given in graphs and tables.

647. KABURAGI, Z. **Forest biological studies on wood quality. (Report 4). On the moisture content, bulk density in green lumber and shrinkage of the compression wood of Todo Fir [*Abies mayriana*].** *Bull. For. Exp. Sta., Meguro, Tokyo* No. 52, 1952 (53–78). 24 refs. [Jap.e.]

812.7. Strength Properties

See also Nos. 699, 717–8, 721, 730–1, 771–2, 814.

648. KOLLMANN, F. Über die Abhängigkeit einiger mechanischer Eigenschaften der Hölzer von der Zeit, von Kerben und von der Temperatur. Erste Mitteilung: Der Einfluss der Zeit auf die mechanischen Eigenschaften der Hölzer. **[Dependence of some mechanical properties upon time [test duration], notches and temperature. 1. Effect of time upon the mechanical properties of woods.]** *Holz Roh- u. Werkstoff* 10 (5), 1952 (187–97). 25 refs. [G.] P.R.

Analysis of the results of mechanical strength tests on wood, made by the author and by other investigators, leads to the conclusion that owing to the plastic properties of wood, the rupture stresses can have real significance only if the time factor is stated. The quicker the stresses are generated, the less likely are relaxation and plastic flow in high-polymer substances such as wood. If the plasticity of wood is related to the sliding of micelles, then an increase of internal 'lubrication' (by water, other plasticizers, or by temperature rise) can be made use of in moulding processes. The plastic properties are responsible for the mechanical hysteresis and, consequently, the damping capacity of wood.

649. KOLLMANN, F. Über die Abhängigkeit einiger mechanischer Eigenschaften der Hölzer von der Zeit, von Kerben und von der Temperatur. Zweite Mitteilung: Die Bedeutung von Kerben für die Holzfestigkeit. **[Dependence of some mechanical properties of wood upon time, notches, and temperature. 2. Effect of notches on strength.]** *Holz Roh- u. Werkstoff* 10 (6), 1952 (239–44). 16 refs. [G.g.] P.R.

Reviews available data on notch effects in tensile and compression, bending, impact, and alternating-stress tests. The theory of notch stresses developed for isotropic and homogeneous materials can also be applied to wood, which is anisotropic and non-homogeneous, especially as regards the local stress concentration round notches. Laminated wood is found to be more susceptible to notch effects than solid wood. Notch effects are considerably greater in tension than in compression, and this difference can be explained from stress/deformation curves. Susceptibility to notch effects is particularly high in impact-rupture tests. In long-duration alternating-stress tests only Pine has so far shown any noteworthy notch effect.

650. KOLLMANN, F. Über die Abhängigkeit einiger mechanischer Eigenschaften der Hölzer von der Zeit, von Kerben und von der Temperatur. Dritte Mitteilung: Die Bedeutung der Temperatur für die Elastizität und Festigkeit des Holzes. **[Dependence of some mechanical properties of wood upon time, notches and temperature. 3. The significance of temperature for elasticity and strength of wood.]** *Holz Roh- u. Werkstoff* 10 (7), 1952 (269–79). 18 refs. [G.g.] P.R.

Summarizes research on the effect of temperature on elastic properties, tensile, compression, bending, breaking and shear strengths, reproducing many graphs from the papers quoted.

651. KLOOT, N. H. **A micro-testing technique for wood.** *Aust. J. appl. Sci.* 3 (2), 1952 (125–43). 11 refs. P.R.

Describes with illustrations the micro-tensile testing machine, capable of testing specimens only 0·08 mm. thick. Specimens are prepared by shaping and slicing a block 1 or 2 in. deep, which can be removed from the standing tree without causing undue damage. A nominal specimen thickness of 80μ has been found most convenient, but tests have been made on specimens 100 and 120μ thick. Moisture determinations were made on specimens from one band of late wood and the adjacent band of early wood in *Pinus radiata*, for a number of growth rings; no significant difference in moisture content was found. Patterns of tensile-strength variation throughout several growth rings for a number of species are shown in graphs. The similarity of patterns of air-dry density variation and of tensile strength within and between growth rings is illustrated from data obtained for *P. radiata*; the correlation coefficient although significant was only 0·37.

812.8. Workability. Working Properties

652. PATRONSKY, L. A., and WORTH, H. E. **Some aspects of wood machinability studies.** *Proc. U.S. For. Prod. Res. Soc.* 5, 1951 (93–7). 12 refs.

The history of machining research and the current developments in this field are discussed. Several basic and applied studies of machining problems are briefly described, with particular reference to

research at the University of Michigan. *From authors' summary.*

813. *Wood Chemistry*

See also Nos. 600, 816 *et seq.*

653. CLERMONT, L. P., and SCHWARTZ, H. **The chemical composition of Canadian woods II.** *Pulp Paper Mag. Can.* 53 (6), 1952 (142–3). 2 refs.

Three discs were taken at stump height, from the middle, and from the top of 10 trees each of *Tilia americana, Fraxinus nigra, Ulmus americana, Pinus resinosa* and *Larix laricina*, and 5 trees each of *Fagus grandifolia, Acer saccharum*, and *Betula lutea.* One half of each disc was used for physical measurements and the other for chemical analyses. Results are tabulated. [Cf. *For. Abstr.* 13 (No. 3331).]

813.1. Chief Organic Constituents. Constituents of the Cell Wall

654. MEREWETHER, J. W. T. **The existence of a lignin-carbohydrate bond and the isolation of lignin.** *Proc. Aust. Pulp Pap. Ind. tech. Ass.* 5, 1951 (226–66). 306 refs. P.R.

A critical review is given of the literature relating to evidence for and against a chemical linkage between lignin and carbohydrate, together with a summary of the methods used for the isolation of lignin. *Author's summary.*

655. CAMPBELL, W. G., and MCDONALD, I. R. C. **The chemistry of the wood cell wall. Part I. The delignification of Beech and Spruce woods by sodium chlorite in buffered aqueous solution.** *J. chem. Soc.* July, 1952 (2644–50). [Forest Products Research Laboratory, Princes Risborough.] O.R.S.

In the delignification of *Fagus sylvatica* and *Picea sitchensis* by aqueous solutions of sodium chlorite, buffered at pH 6·3 at 50° and 70°, some 90% of the acid lignin can be removed from each wood without significant loss of polysaccharide, but attempts to delignify the wood residues further cause appreciable loss. Chemical analysis of some partly delignified residues, containing 5–90% of the original acid lignin, indicated that there was retained in the wood residues a modification of lignin which is not determined by the 72% sulphuric-acid method. The total percentage of polysaccharide present in each wood is considerably less than $100 - x$, where x is the acid-lignin content of the original wood; therefore it may be inferred that x does not equal the total lignin content of the wood. Any determination of 'holocellulose' based on a yield equivalent to the formula $100 - x$ is erroneous because even though the acid-lignin content may be small there is also present a large proportion of 'modified lignin'. *Authors' summary.*

656. FREUDENBERG, K. Über natürliches und künstliches Lignin. **[Natural and artificial lignin.]** *Angew. Chem.* 64 (13), 1952 (353–4). [G.] [Universität Heidelberg.] D.S.I.R.

Coniferyl alcohol can be converted by fungal dehydrogenases into a lignin-like material not perceptibly different from natural lignin. A precursor of the artificial lignin was obtained—the crystalline dehydro-di-coniferyl alcohol, having a structure corresponding to that of dehydro-di-isoeugenol. The yield amounted to 30% and there is no doubt that a large proportion of the structural units of the artificial lignin exists in this form. The presence of aliphatic ether bonds is indicated by the acid polymerizate from sinapin alcohol, which, like coniferyl alcohol, is a component of hardwood lignin; and also by a dehydration dimerizate produced from sinapin alcohol and its glucoside syringin by a crude preparation of emulsin, which contains a dehydrogenase; the constitution of the dimerizate corresponds to that of pinoresinol but it is optically inactive. A catechol dehydrogenase and one or more peroxidases are present in the cambium of conifers and in the cells newly differentiated inside the cambium. Both enzyme systems are largely confined to the cells. Like the fungal enzyme they can convert coniferyl alcohol into lignin-like dehydration polymers. Dehydro-di-coniferyl alcohol is present and is therefore also regarded as a structural component of natural lignin.

In the cells undergoing lignification, between the cambium and the wood, a strictly localized glucosidase was found. Coniferyl alcohol, liberated by the glucosidase from the glucoside coniferin which is present in the cambium, is believed to be converted into lignin by the enzymes of the living tissues.

657. FREUDENBERG, K., REZNIK, H., BOESENBERG, H., and RASENACK, D. Das an der Verholzung beteiligte Fermentsystem. **[The enzyme system taking part in lignification.]** *Chem. Ber.* 85 (6), 1952 (641–7). 14 refs. [G.g.] P.R.

A strictly localized glucosidase has been shown to take part in lignification. The dehydrogenating and oxidizing cambial enzymes are able, like the fungal dehydrogenase so far used, to form lignin-like polymerization products from coniferyl alcohol.

658. NORD, F. F., and STEVENS, G. DE. **Studies on lignin and lignification.** *Transactions of the New York Academy of Sciences (Ser. 2)* 14 (2), 1951 (97–102). 40 refs. L.S.

Presents the general results of some of the authors' previous work on the chemistry of lignin and its possible mode of synthesis in woody tissues. Native lignin (EtOH-soluble fraction) has been found to be identical with the alcohol-extractable lignin left after attack on wood by 'brown rot' fungi which cause cellulose depletion. Another study seems to show that *Lentinus lepideus* produces methyl-par-methoxy cinnamate when carbohydrates or ethyl alcohol serve as substrates, the key intermediate in the enzymatic formation of the ester being acetaldehyde.

659. STEVENS, G. DE, and NORD, F. F. **Investigations on lignin and lignification. IX. The relationship between the action of brown rot fungi, cellulose degradation and lignin composition in bagasse.** *J. Amer. chem. Soc.* 74 (13), 1952 (3326–8). 13 refs. O.R.S.

Discusses the comparative effect on the cellulose, and the lignins liberated by, the softwood fungi *Poria vaillantii* and *Lentinus lepideus*, and the hardwood fungi *Daedalea quercina* and *Polyporus sulphureus.*

660. Stevens, G. de, and Nord, F. F. **Investigations on lignin and lignification. X. The isolation and characterization of the native lignin from Kiri wood [*Paulownia tomentosa*].** *J. Amer. chem. Soc.* 74 (13), 1952 (3447–8). 10 refs. O.R.S.

Cf. *For. Abstr.* 13 (Nos. 3336–7).

661. Pew, J. C. **Structural aspects of the color reaction of lignin with strong acid.** *J. Amer. chem. Soc.* 74 (11), 1952 (2850–6). 13 refs. [Forest Products Laboratory, Madison.] O.R.S.

Discusses the results of a spectroscopic examination of the green colour produced by the action of strong acid on Spruce wood and gives graphs showing the absorption spectra of Spruce and of model substances.

662. Hess, C. L. **An investigation of the homogeneity of isolated native Black Spruce lignin.** *Tappi* 35 (7), 1952 (312–20). 26 refs. P.R.

663. Traynard, P., and Robert, A. Sur une nitrolignine cristallisée. **[A crystalline nitrolignin.]** *Bulletin, Association Technique de l'Industrie Papetière, Paris* 5 (7), 1951 (401–5). [F.f.] L.S.

A crystalline 'lignin' has been obtained by treating 600 g. of Poplar sawdust in 6 litres of acetic acid at 40° C. with 165 c.c. of concentrated fuming HNO_3, added drop by drop during 4 days. The molecular weight of the product is ca. 1150; the infra-red spectrum is of the lignin type. So far the following structural characteristics have been ascertained: 4 acid groups, and 2 phenol groups.

664. **Wood hydrolysis [of *Eucalyptus regnans*].** *Rep. Commonw. sci. industr. Res. Organ. Aust. 1950/51*, 1951 (85).

Experiments have shown that normal wood of Mountain Ash [*Eucalyptus regnans*] hydrolyses more than twice as fast as does tension wood, thus confirming that all the cellulose in tension wood is more highly orientated than that in normal wood. There is also more resistant cellulose in tension wood. Early and late wood hydrolyse at about the same rate. No systematic trends were observed in rates of hydrolysis of butt, centre, and top log samples from the outer heartwood zones.

665. Stewart, C. M., and Harvey, L. J. **Sub-project C.5–4. Association of carbohydrates within themselves and with lignin. Progress report No. 5. The non-resistant polyaldouronide hemicellulose content of *Eucalyptus regnans* F.v.M. wood as determined by methanol and water extractions of holocellulose.** Division of Forest Products, Commonwealth Scientific and Industrial Research Organization, Melbourne. 1952. pp. 16. 23 refs. P.R.

The holocellulose contained 16–18% of non-resistant polyaldouronide hemicellulose, which was completely liberated from the remaining carbohydrate constituents in a comparatively short extraction time. Water extraction solubilizes all of the non-resistant hemicellulose, even the methanol-insoluble portion remaining after methanol extraction.

666. Thompson, J. O., and Wise, L. E. **Some molecular properties of the hemicelluloses of Big Tooth Aspen.** *Tappi* 35 (7), 1952 (331–6). 22 refs. P.R.

Hemicellulose fractions were extracted with aqueous KOH directly from the wood meal (and also from holocellulose). Viscosity and osmotic-pressure measurements indicated an average degree of polymerization of 155. Aqueous solutions exhibited the typical electroviscous behaviour of polyelectrolytes. It was found that scissioning occurred in H_2O solution in the presence of alkali or of dilute mineral acid, and also on warming to ca. 60° C. or higher. Degradation in H_2O solution at 100° C. was marked and was accompanied by a significant decrease in pH. *From authors' summary.*

667. Jones, J. K. N., and Wise, L. E. **The hemicelluloses present in Aspen wood (*Populus tremuloides*). Part I.** *J. chem. Soc.* July, 1952 (2750–6). [Institute of Paper Chemistry, Appleton, Wis.] O.R.S.

Hydrolysis of extractive-free Aspen sawdust yields *l*-rhamnose, *l*-arabinose, *d*-xylose, *d*-galactose, xylobiose, xylotriose, 4-methyl-*d*-glucuronic acid and several oligosaccharides containing uronic acids. The action of periodate on the sawdust and on isolated hemicellulose has been examined. The results are discussed. *Authors' summary.*

668. Roudier, A., and Eberhard, L. La présence des mannanes dans le bois des arbres appartenant au sous-embranchement des Angiospermes. **[The presence of mannans in wood of trees belonging to the Angiosperms.]** *C.R. Acad. Sci., Paris* 235 (2), 1952 (207–9). 12 refs. [F.] O.R.S.

The following % of mannans (calculated on the basis of dry weight) were found in samples from winter-felled trees: *Carpinus betulus* 0·6%; *Quercus robur* 1·07%; *Populus robusta* 0·96%; *P. tremula* 0·64%; *Ulmus campestris* 1·30%; and *Tilia cordata* 0·95%. None was found in cereal straw. Photographs are given showing the chromatograms of galactose and glucose, mannose, arabinose and xylose from each species.

813.2. Minor Organic Constituents. Extractives. Cell Contents

See also Nos. 787, 818.

669. Hillis, W. E. **Sub-project C.7–7. Extractives in wood in relation to durability. Progress report No. 1. Minor constituents of various tree tissues.** Division of Forest Products, Commonwealth Scientific and Industrial Research Organization, Melbourne. 1952. pp. 24 + 23 dgms. 21 refs.

Presents results of paper partition chromatographic studies of 23 species undertaken to ascertain whether there is any significant difference in the nature of the minor constituents of the tissues of different types of trees. In most cases there was close similarity within each of the 11 families, and characteristic differences between families. With few exceptions the heartwood contained the sapwood components, but in much larger quantities. Trees without heartwood contained only very small amounts of the minor constituents present in heartwood, and it is suggested that the increased amount of extractives in heartwood is formed from the starch in the sapwood cells during the stage preceding death. *From author's summary.*

670. KING, F. E., KING, T. J., and WARWICK, A. J. **The chemistry of extractives from hardwoods. Part VII. Constituents of Muninga, the heartwood of *Pterocarpus angolensis*. B. 2 : 4-dihydroxyphenol 1-*p*-methoxyphenylethyl ketone (angolensin).** *J. chem. Soc.* May, 1952 (1920–4). [The University, Nottingham.] O.R.S.

Angolensin, a further constituent of the resin extracted from the heartwood of *P. angolensis* [cf. *For. Abstr.* 13 (No. 4223)] has been identified as 2:4-dihydroxyphenyl 1-*p*-methoxyphenylethyl ketone.

814. *Natural Durability. Old Wood. Fossilized Wood*

See Nos. 118–9, 719, 721, 758, 778, 793.

815. *Effect of Growth Factors on Structure and Properties*

See Nos. 176, 627–9, 633, 638, 642–3, 646, 651, 820, 834–5.

82. CONVERSION, SHAPING, ASSEMBLY AND FINISHING OF WOOD: GENERAL

See also No. 652.

671. HORDERN, R. H. **Woodworking machinery. Theory and practice.** Sir Isaac Pitman & Sons, Ltd., London. 1952. pp. vii + 154 + 6 photos. Price 15*s*. P.R.

Contains sections, illustrated by many diagrams, on: circular saws; cutters for straight planing; thicknessing machine; mortise machine; tenoning machine; cutter-blocks; spindle moulder; moulding machines; woodturning lathe; growth and structure of timber; and costing and estimating.

821. *Barking*

See also No. 8.

672. DICK, G. M. **Modern developments in barking drum design.** *Tappi* 35 (5), 1952 (212–7). P.R.

History and development of barking-drum design; analysis of various models of barking-drum shell; design features of an all-welded barking drum.

673. FOBES, E. W. **Portable barker developments.** *Paper Tr. J.* 134 (13), 1952 (22, 24, 26, 28, 30). P.R.

An illustrated description of transportable barkers now in use in the U.S.A. The following types are listed: (*A*) Cambium-destruction machines: (1) hammer barkers; (2) drum barkers; (3) hydraulic barkers; (4) direct-pressure barkers; and (*B*) knife machines: (1) revolving disks with knives; (2) fixed-cutterhead machines; (3) floating-cutterhead machines, and (4) fixed-knife machines. Production figures (cords/machine-hour, cords/man-hour, and h.p. hours/cord), machine costs, and cost per cord per hour, are tabulated for the above machines as well as for stationary drum-barkers. (A1) gives greatest output in cords/machine-hour, and in cords/man-hour, while (B3) is most economical in h.p. hours/cord; (A1) (chain barker) gives the lowest investment cost per cord per hour.

674. WILSON, T. **The hydraulic slab barker operation in the Macmillan and Bloedel pulp mill at Port Alberni.** *Pulp Paper Mag. Can.* 53 (6), 1952 (111–5).

Describes the barker, and discusses production and maintenance problems.

675. JUŠTŠUK, E. Schwedische Entrindungsmaschinen. **[Swedish barking machines.]** *Holz Roh- u. Werkstoff* 10 (6), 1952 (229–38). 5 refs. [G.g.] P.R.

An illustrated description of Swedish machines for barking logs at sawmills. Three pre-treatment plants (steam, water, or steam-and-water treatment), 5 cutting barkers, and 8 friction barkers are illustrated and described in detail. The output of the Andersson's pneumatic-friction-principle barker is tabulated for different log diameters and two feeds. The total cost of barking (in öre/cu.ft.) is: 2·04 for cutting barkers, 1·88 for friction (log against log), and 1·28 for friction (tool against log) barkers.

676. BRITISH BASKET & BESTO CO. LTD., and PIGGOT, G. D. **A new or improved machine for stripping bark from logs.** *Brit. Patent* No. 664,771, Jan. 9, 1952. pp. 3 + 4 dgms. P.O.

The machine is equipped with bark-stripping blades on pivotally mounted spring-loaded arms, the blades adjusting themselves to suit the section of the log being stripped.

822. *Saws and Sawing*

See also Nos. 8, 703–6.

677. RÜB, F. Hochleistungswerkzeuge für die Holzbearbeitung. **[High-speed tools for woodworking.]** *Holztechnik* 32 (5), 1952 (260–2, 283). [G.] P.R.

An illustrated account of modern saw blades for circular, band, and frame saws, and wood moulding cutters.

678. DRAKE, C. E. **Carbide tipped saws.** *Sth. Lumberm.* 185 (2311), 1952 (72 . . . 80).

Discusses economic considerations, saw design, 'controlled cut' saws, tension, feed control and maintenance of carbide-tipped saws.

679. SKJELMERUD, H. Sagblad med stukete og vikete tenner. **[Sawblades with swage-set and spring-set teeth.]** *Norsk Skogind.* 6 (4), 1952 (113–21). 5 refs. [Nor.e.] P.R.

Discusses recent research [cf. *For. Abstr.* 12 (No. 2465)] and concludes that the advantages obtained by using swage-set teeth will not be sufficient to alter the industry to any extent.

680. **Band saw setting—an interesting new machine.** *Timb. Tr. J.* 202 (3957), 1952 (296).

The 'Lasso-Rapid' bandsaw-setting machine has been introduced to the U.K. market by C. D. Monninger Ltd., Tottenham, London, N.15. The equipment operates a pair of rollers, each with a wavy-shaped surface, which press the bandsaw's toothed edge so as to give a wavy sawing line. The teeth are thus set in a series following the line of the waves, instead of each tooth being individually set. The method is claimed to give a smoother and more even cutting surface.

823. *Planing, Cutting of Mouldings. Chiselling, Mortising and Tenoning. Boring. Turning*

See also Nos. 677, 729.

681. HAYCOCK, A. H. **Spindle moulding.** The Technical Press Ltd., London. 1952. pp. xii + 124 + 18 photos. Price 10*s.* 6*d.* P.R.

824. *Forms of Joint. Jointing and Assembly*

824.1. Nailed Joints

682. STERN, E. G. **Nails and screws in wood assembly and construction.** *Proc. U.S. For. Prod. Res. Soc.* 5, 1951 (305–17). 41 refs.

A general, illustrated review of the design, manufacture, efficiency, and technical and economic advantages of modern threaded-shank nails as compared with plain-shank nails and screws, including also a brief note on clinching and self-clinching nails. An appendix gives comparative test data in 11 tables.

824.4. Dowelled Joints

683. BEDELL, J. H., NORTON, N. A., and NEARN, W. T. **A preliminary study of the effect of hole size on the strength of dowel joints in tension.** *Res. Pap. Pa. St. For. Sch.* No. 16, 1952. pp. 5. 3 refs.

824.8. Glues and Gluing

See also Nos. 711, 714–8.

684. KNIGHT, R. A. G. **Adhesives for wood.** Chapman and Hall Ltd., London. 1952. pp. xi + 242 + 9 plates. Many refs. (Monographs on Metallic and other materials published under the authority of the Royal Aeronautical Society, Vol. III.) Price 25*s.* [Forest Products Research Laboratory, Princes Risborough.] P.R.

Contains sections on: glues of natural origin; synthetic-resin adhesives; factors in gluing technique; conditions under which adhesives are used; testing adhesives; classification of glues according to their durability; the bonding of wood to other materials; and a glossary of special terms. There are numerous graphs and tables and a list of references for each chapter.

685. Tenue des collages aux intempéries. **[Resistance of glues to weathering.]** *Rapp. Fonds for. nat. Jan./Dec. 1951, Annexe V* 1952 (118–9). [F.] [Institut national du Bois, Paris.]

Reports briefly on trials of a number of glues, by repeated soaking and drying of glued test pieces of Beech. Phenol, resorcinol and melamine glues gave the best results.

686. Utilisation de l'albumine de sang comme charge dans les colles phénoliques. **[The use of blood albumin as an extender of phenolic glues.]** *Rapp. Fonds for. nat. Jan./Dec. 1951, Annexe V* 1952 (119). [F.] [Institut national du Bois, Paris.]

687. ARNOLDT, W. Das Strecken des Kauritleims —technisch betrachtet. **[The extending of Kaurit glue considered from the technical point of view.]** *Holztechnik* 32 (5), 1952 (255–8). [G.] P.R.

Presents results of tests on (1) the clogging of mixtures of various extenders with water, (2) dry and wet binding strength for 'Kaurit glue W liquid' extended with different extenders. Moderately swelling extenders having a maximum water-absorption coefficient of 1·8 have been found to give good results. The amount of dilution plays a very important part, and the addition of too much water gives poor results. The water resistance of a synthetic-resin bond decreases as the proportion of extender increases, particularly if unsuitable extenders are used. Fillers are not recommended, because they increase tool wear. The disadvantages of too high or too low a wood moisture content when gluing with extended glues are discussed.

688. Contrôle de l'état de la colle caurite au moment de l'emploi. **[Control of the state of Kaurit glue at the time of use.]** *Rapp. Fonds for. nat. Jan./Dec. 1951, Annexe V* 1952 (116–8). [F.] [Institut national du Bois, Paris.]

Further results of this study [cf. *For. Abstr.* 13 (No. 2472)] are the establishment of a limit of viscosity below which pure Kaurit [urea-formaldehyde] glue can be used in ordinary conditions: $v = 1{\cdot}6\,n$, where n = dropping time in seconds; and the optimum temperature, 3° C., in which to test viscosity of Kaurit. Methods of testing are set out in detail.

689. NARAYANAMURTI, D., and DHAMANEY, C. P. **Studies on adhesives. Part XVI. Plywood adhesives from Cashew nut shell liquid.** *Indian For.* 78 (6), 1952 (301–4).

[Cf. *For. Abstr.* 12 (No. 1284).] Cashew-nut shell liquid, with the addition of 10% phenol, can be condensed with formaldehyde in the presence of ammonia, and the resins so obtained, when mixed with suitable hardeners, make satisfactory thermo-setting plywood adhesives. They require longer curing times than phenol-formaldehyde adhesives.

690. GOLICK, A. J., and MAAS, J. J. (to Monsanto Chemical Co.). **Rapid gluing process.** *U.S. Patent* No. 2,537,343, Jan. 9, 1951. pp. 5. P.O.

Gluing with a casein glue of pH $\geqslant$ 10, by applying glue to one of the surfaces, and to the other surface an aqueous solution of a water-soluble reaction product of an aldehyde (e.g. formaldehyde) and nitroparaffin (or an amide), and pressing the treated surfaces together.

691. STANLEY, G. W. **Machining, handling, flow of materials and control in gluing.** *Proc. U.S. For. Prod. Res. Soc.* 5, 1951 (280–4).

Points out some common errors in design and practice, and stresses the importance of correct timing in the sequence of operations. It is particularly important to avoid indiscriminate mixing of species, inadequate seasoning time, and short-cutting of proper machining operations.

692. BOCK, E. Der Abbindungsprozess bei der Holzverleimung. **[The hardening process in gluing wood.]** *Holz Roh- u. Werkstoff* 10 (7), 1952 (284–8). [G.g.] P.R.

693. YAVORSKY, J. M. **Research in electronic wood gluing.** *Proc. U.S. For. Prod. Res. Soc.* 5, 1951 (285–91). 8 refs.

Reviews the state of knowledge of the fundamental dielectrical behaviour of wood, glue, and wood/glue combinations, on the basis of exploratory work reported in literature and studies in progress at the New York State College of Forestry. Practical conclusions are summarized.

694. PETZ, A. Holzverfärbungen bei Verleimung mit Kunstharzen. **[Staining of wood during gluing with synthetic resins.]** *Holztechnik* 32 (7), 1952 (368). 2 refs. [G.] P.R.

Staining caused by Fe in wood occurs very rarely in synthetic-resin gluing, and can be removed by washing with K oxalate. A reddish-brown colour sometimes observed when using the urea-resin glues with different cold hardeners has been found to be caused by excess of hardeners; these stains are first treated with ca. 12% NH_4OH, then with K oxalate, and finally rinsed with warm water. Both oxalic acid and K oxalate, when used in higher concentrations, can themselves be a cause of brown stains, hence if stains are not removable by low concentrations of these, H_2O_2 should be used instead.

826. *Peeling. Slicing. Trimming and Edging of Thin Sheets*

See Nos. 708–9.

827. *Bending. Moulding (other than by Cutting)*

See also Nos. 711, 767.

695. STEVENS, W. C., and TURNER, N. **Modifications of a method of improving the steam bending properties of certain timbers.** *Wood* 17 (8), 1952 (296–9). [Forest Products Research Laboratory, Princes Risborough.]

Gluing a thin lamina of wood with good bending properties to the face which when bent will have the maximum compressive strain [cf. *For. Abstr.* 12 (No. 457); 13 (No. 4265)] is only possible when a supply of good bending wood is available, and the mixture of species may be objectionable aesthetically. In the modified method the supporting layer, which need not necessarily be a good bending wood, is arranged so that its grain is at right angles to that of the thicker piece, then glued, steamed and bent in the normal way. Successful results were obtained with a number of tropical hardwoods, including *Cistanthera papaverifera*, *Berlinia* sp., *Gossweilerodendron balsamiferum*, *Mitragyna stipulosa* and *Khaya ivorensis*. It was not found necessary to dry the assemblies to be glued to a uniform moisture content not exceeding 20%; instead, drying only the surface layers to a depth of about $\frac{1}{8}$ in. to this figure gave satisfactory adhesion. The bends made in this test series had a radius of $6\frac{1}{2}$ in. and each piece was 3 ft. $3\frac{3}{8}$ in. long, $2\frac{1}{4}$ in. wide and 1 in. thick excluding the supporting layer. Results are discussed and illustrated with some photographs. The thickness of the supporting layer needed to produce bends free from buckling on the face or wrinkling at the edges depended on the bending properties of the material to which it was glued; buckling in the concave face of *Guarea thompsonii*, a fairly good bending species, could be prevented by using a cross-banded layer $\frac{1}{16}$ in. thick of the same species, while *Khaya ivorensis*, a poor bending wood, needed five $\frac{1}{16}$-in. *K. ivorensis* veneers. It is not possible to calculate from existing bending data the minimum thickness of supporting layer to be used for a particular type of bend, and preliminary tests must generally be made. In tests on 1-in. specimens of *Guarea cedrata* supported by a $\frac{1}{16}$-in. veneer of *K. ivorensis* the limiting radius of curvature was reduced from 9 to 5 in. It is probable that bends produced from a good bending timber, where this is available, will be cheaper than those made by the glued assembly method. Further information on the new method may be obtained from the Director of the Forest Products Research Laboratory.

696. PILLOW, M. Y. **Selecting White Oak trees for bending lumber.** *Proc. U.S. For. Prod. Res. Soc.* 5 1951 (87–92). 4 refs.

White Oak for bending, meeting U.S. Navy specifications, was found to be produced from straight, well-formed, large trees, characterized by vigorous growth, a weight of not less than 40 lb./cu. ft., and 6–15 annual rings per in. *Author's summary.*

829.1. *Finishing*

See also No. 712.

697. GRAHAM, P. **Metallizing of wood can be accomplished easily when fundamental rules are followed.** *Wood, Chicago* 57 (6), 1952 (25, 40, 64). P.R.

Describes the principles of spray metallization of wood. Resinous woods which have a tendency to sweat when heated should be metallized in slow and successive stages. The surface of any wood to be metallized should be dry, clean, and sufficiently porous to permit adhesion. Spraying of metal in a concentrated particle-stream often causes highly stressed metal deposits that may crack over a curved surface or separate from a flat surface. The tendency to crack or warp can be counteracted by increasing the distance between the gun and the work. The article ends with a description of an apparatus developed to determine the contraction characteristics of various metallized spray coatings.

83. TIMBER MANUFACTURING INDUSTRIES AND PRODUCTS. USES OF WOOD AS SUCH

831. *Fuelwood and Various Types of Rough Timber*

See also Nos. 367, 576, 583, 640, 758, 760–3.

698. REID, W., HOLLINGSWORTH, B. C., and WILSON, H. H. **The use of timber in mining.** *Forestry* 25 (2), 1952 (92–103).

The paper considers briefly the history of the use of timber underground and the general problem of support, and goes on to discuss the two main uses for timber in mining, i.e. on roadways and at the coal face, where the two principal methods of working are pillar and stall working and longwall working. Species whose timber is useful for supports are listed and the various kinds of supports given, together with the chief factors affecting their behaviour.

Replacement of timber by steel is discussed, and in considering the outlook for home-grown timber props, emphasis is laid on the need to supply only the best types properly prepared and seasoned. *Authors' summary.*

699. ROBERG, J. Festigkeitsrechnung im Dienste der bergmännischen Holzwirtschaft. [**Calculations of the strength of mining timbers.**] *Glückauf, Essen* 87 (49/50), 1951 (1139–49). 6 refs. [G.g.] D.S.I.R.

Presents tabulated results of experiments on compression, bending, and crushing strength of various types of mining timbers, conducted at the German Rope-Testing Station, Bochum. It has been shown that, contrary to general belief, thicker timbers do not possess a greater compressive strength than thinner timbers.

700. WAKEFIELD, W. E. **The effect of exposure on Douglas Fir cross-arms.** *Bull. For. Br. Can.* No. 104, 1952. pp. 16.

Tests indicate that 25 years of service life is about the economic limit for Douglas Fir cross-arms (without special preservative treatment) exposed to conditions prevalent in Central Ontario.

701. QUIGLEY, K. L. **Fence posts, a potential market for Missouri Pine timber.** Missouri State Division of Resources and Development, Jefferson City, Mo. 1951. pp. 9.

Includes photographs of a number of different species of fence posts and types of fence.

702. PEREIRA, J. ARANHA, and RUSSO, A. Cêrcas marginais das rodovias. Moirões tratados, em instalações móveis, resolvem esse problema. [**Roadside fences. Posts treated in mobile plants solve this problem.**] *Publ. Inst. Pesqu. tech. S. Paulo* No. 441, 1951. pp. 7. [Port.]

Suggests that the problem of meeting the demand for fence posts in Brazil might be answered by constructing mobile preserving units, by establishing small *Eucalyptus* plantations to supply the posts, and by exploring the possibilities of some native species for this purpose. Some figures are presented showing the estimated costs of the plantations and the preservative treatments.

832. *Mills, Their Functions and Products*

See also Nos. 671 *et seq.*

832.1. Sawmills and Planing Mills

See also Nos. 582, 585–6, 589–90, 597, 671, 677 *et seq.*, 740–1, 807.

703. **Estate yards.** *Bull. Minist. Agric., Lond.* No. 155, 1952. pp. 55 + 8 photos. Price 3*s.*

Includes sections on the estate sawmill, seasoning and storing of timber, and timber preservation.

704. LANE, P. H. **Circular sawmills in the Tennessee Valley region.** *Proc. U.S. For. Prod. Res. Soc.* 5, 1951 (17–25).

Presents some statistics on operation, based on a study of 58 circular-saw mills, and indicates remedies for some of the basic problems.

705. DARGAN, E. E. **The use of gangsaws in the manufacture of Southern Pine lumber.** *Proc. U.S. For. Prod. Res. Soc.* 5, 1951 (32–5).

Describes the operation of a round-log gangsaw cutting Southern Pine at Conway, S.C., and presents a statistical analysis of the log input and lumber output of the mill.

706. KNEŽEVIĆ, M. Raspored gaterskih testera (španung) pri maksimalnom kvantitativnom iskorišćenju. [**Spacing of frame-saw blades for maximum yield of lumber.**] *Glasn. šum. Fak., Beograd* 4, 1952 (1–72 + 2 gphs.). 8 refs. [Serb.e.]

A mathematical evaluation of the maximum yield in cutting cylindrical and elliptical logs into edged boards is followed by an analysis of the absolute and % yield and the effect of kerf width on the yield. The results obtained are applied to several practical cases. [Cf. *For. Abstr.* 11 (No. 2962).]

832.2. Veneer and Plywood Mills, including the Manufacture of Composite-wood Assemblies

See also Nos. 587–8, 597, 684 *et seq.*, 725, 728, 732, 737–8, 765.

707. [**Plywood tests of British Guiana timbers.**] *Rep. For. Dep. Brit. Guiana 1950*, 1951 (8).

Moderately satisfactory plywood can be made from *Catostemma commune*, *Alexa leiopetala* and *Sterculia pruriens.*

708. HARRIS, N. A. **Veneer lathe knife holder system.** *Veneers & Plyw.* 46 (5), 1952 (30, 32). P.R.

An illustrated description of a special holder made of a heavy machined steel section, cadmium plated, and fitted with 3 sets of push-and-pull studs to adjust the knife as it wears. Three holders are required to ensure that one is always ready for the lathe. Only a few minutes are required to remove a holder and insert a new one in the lathe, and no knife setting is required. The knives are sharpened and set while in the holders.

709. HYLER, J. E. **Cutting, clipping separated by veneer reeling method.** *Veneers & Plyw.* 46 (5), 1952 (22, 24, 28–9). P.R.

A detailed description of the special equipment on the veneer side of the rotary lathe, which winds the veneer on to a reel as it is cut. The reels are stored on a rack from which they are removed as required for cutting into sheets by an automatic clipper. The reeling device prevents bottlenecks and delays in operation, thus increasing the production of both lathe and clipper, and the veneer yield per log.

710. HYLER, J. E. **Veneer drying operations and equipment.** *Sth. Lumberm.* 184 (2302; 2304; 2306; 2308; 2310), 1952 (49 . . . 52; 55 . . . 62; 55 . . . 58; 49–50; 49–51).

711. **X-rays in woodworking as production and safety aid. Study of glue films indicates bending form adjustments.** *Woodwkg. Ind.* 9 (6), 1952 (352). P.R.

A brief description of a portable X-ray plant developed in Germany for use in various branches of woodworking. It enables cements or glues to be examined in the ply for irregularities. Foreign bodies are most easily detected (nails, wire, and the like). The effect of plies in laminated timber bends is easily observed, and wavy core can be detected through the plies. The study of photographs of the

bending of laminates shows the position of the glue films at various stages of the process. [Cf. *For. Abstr.* 14 (No. 776).]

712. Welch, A. R. **Improved coated wood product.** *Brit. Patent* No. 665,672, Jan. 30, 1952. pp. 4 + 6 dgms. P.O.

A plywood panel with at least one outer ply having fissures or other imperfections, a continuous layer of a mixture of synthetic thermo-setting resin with sander dust or sawdust being bonded under heat and pressure to the imperfect ply surface.

713. Welch, A. R. **Method of and apparatus for making improved wood products.** *Brit. Patent* No. 665,673, Jan. 30, 1952. pp. 11 + 12 dgms. P.O.

Cf. preceding abstract.

714. Perry, T. D. **Unusual hot presses.** *Wood Wkg. Dig.* August, 1952 (129 . . . 138). P.R.

Describes, with illustrations, some new machines with both heating attachments for curing resin glues and clamping equipment used for making plywood corners, fixing rails or bands to plywood table or desk tops, and for scarf jointing.

715. Horioka, K., and Furuse, M. **Studies on plywood. Report No. 1. On water-proof plywood glued with cold-setting phenol-formaldehyde resin.** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 51, 1951 (33–60). 7 refs. [Jap.e.]

Two brands of commercial phenol-formaldehyde cold-setting resin were used with β-naphthalene-sulphonic acid as hardener, and the optimum values of hardener addition and temperature were determined. Formulae were derived for (1) relation between the optimum temperature and the time of treatment following cold pressing for 24 hours at 20° C.; and (2) relation between the heating temperature (range 30–60°) and the boiling-test strength. Best results were obtained for veneers with 10% moisture content, and for glue mixes containing 70–76% of resin. The amount of glue used was 35–40 g./sq. ft. [385–440 g./sq. m.]. Diatomaceous earth proved to be a better extender than wheat flour. The adhesion rates for 5 temperatures were evaluated, from an empirical formula, for one of the two resins, and it was found that these rates (in arbitrary units) were: 20°, 0·0297; 30°, 0·671; 40°, 1·000; 60°, 1·729, and 80°, 2·045. Hence, the lowest temperature to be used in industry is 30°.

716. Shigesawa, S., and Nakagawa, S. **Studies on plywood. Report No. 2. A study of glue lines in casein-glued plywood.** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 51, 1951 (85–96 + 3 photos). 13 refs. [Jap.e.]

It was found that the strength of casein-glue joints in plywood depends to a large extent upon the time of assembly; too long or too short a time is unfavourable, the optimum time varying with species, and also with the moisture content of the veneers, the viscosity of the glue, and other factors. The average thickness of glue line is 60–70μ; thicker glue-lines are obtained when the time of assembly is long. No relationship has been found to exist between the depth of penetration of glue and the time of assembly. The cut cell-walls seem to play an important part in the glue joints, but they do not act as a homogeneous surface: the highest bonding strength seems to exist between glue and the middle lamella of the secondary wall.

717. Lewis, W. C. **Fatigue of wood and glued joints used in laminated construction.** *Proc. U.S. For. Prod. Res. Soc.* 5, 1951 (221–9). 2 refs.

Discusses fatigue-test procedures for wood and glued-wood constructions, and gives results of tests of clear wood and wood with glued scarf joints, both in tension parallel to the grain, of a glued joint in shear, and of wood and glued wood in tension perpendicular to the grain. Douglas Fir and White Oak were used. Appropriate stress/fatigue-life curves are presented and discussed. The data warrant the following conclusions, provided that the glue used is as resistant to fatigue as a resorcinol resin: (1) Glued-laminated construction can be used, with confidence in its resistance to failure in fatigue, in applications where solid-wood construction has proved satisfactory. (2) Scarf joints with a 1 : 8 or flatter slope in individual laminations can be expected to withstand repetitions of stress as well as a continuous lamination, provided that reductions in design stresses are made for the reduction in static strength. (3) The fatigue strength for dry wood in tension parallel to the grain at 30 million cycles of stress is about 50% of the static strength, provided that the wood is straight-grained and has no defects and the condition of loading (stress ratio of 0·10) is the same as that used in these tests. (4) There was no evidence that the glue tended to deteriorate owing to fatigue any faster than the wood round it. (5) The fatigue strength of a glue joint in shear is 40–45% of the static strength when a stress-raiser similar to the re-entrant angle used in these tests is present and the condition of loading (stress ratio of 0·10) is the same as that used in these tests. (6) There is no tendency for a glue line to deteriorate in fatigue any faster than the wood itself when tensile stresses are perpendicular to the grain and to the glue line. *From author's summary.*

718. Lombardi, G. Der zusammengesetzte Druckstab aus Holz. [**Composite pressure strut made of wood.**] *Schweizerische Bauzeitung, Zürich* 69 (22), 1951 (301–3). [G.] *Abstr.* in *Index aeronauticus* 7 (11), 1951 (167–8). P.O.

The object of this report is to consider the problem of analysing mathematically a continuous union of several pieces of wood and to obtain formulae which determine the properties of such pressure struts and their binding material. The binding material is assumed to be distributed uniformly along the whole length of the strut. Since no further assumption regarding the method of binding is required, the results are applicable to every kind of bond. The case of 3 laminations is worked out in detail, assuming a symmetrical shape. A strut with 5 laminations can be dealt with in a similar manner. The case of 4 laminations is a special case of this. In a similar fashion, the formula for 3 laminations can be used for 2 laminations. The report concludes with a comparison between the two-lamination strut and a solid strut, where it is

shown that the formulae obtained are in good agreement with the general Eugesser formula by Stussi for a solid strut.

833. *Timber in Buildings and Engineering Structures (Manufacture and Use)*

See also No. 100.

833.1. Building Components and Fittings: General

See also Nos. 639, 763, 789.

719. **Hardwoods for building and general purposes.** H.M. Stationery Office, London. 1951. pp. 18. Price 1*s.* 3*d.*

Lists 115 temperate and tropical hardwoods, tested at the Forest Products Research Laboratory, and found suitable as substitutes for softwoods, in the 3 classes light, medium, and heavy, giving for each species its average weight/cu. ft., resistance to decay, and notes on its characteristics and uses.

720. CLIFFORD, N. **Tropical hardwoods for building.** *Builder, Lond.* 110 (5689), 1952 (338–9). D.S.I.R.

Discusses the suitability as building timber of *Cordia goeldiana, Terminalia ivorensis, Shorea* sp., *Tarrietia* sp., and *Gossweilerodendron balsamiferum.*

721. WATSON, C. J. J. **North Queensland building timbers and specifications for their use.** *Pamphl. Qd. For. Serv.* No. 1 (revised), 1951. pp. 50.

Lists timbers approved for different building purposes, tabulates data on durability, strength, colour, hardness and weight of the different species, and quotes the Australian standard grading rules for milled flooring and structural timbers. The index is arranged by (1) timbers, (2) specified uses and (3) timber qualities and use limitations.

722. GRANUM, H., and BIRKELAND, Ø. Bygningsindustriens ønsker med hensyn til dimensjoner og lengder for trelast til trehusbyggingen. **[The building industry's wishes about dimensions and lengths of timber for timber frame houses.]** *Norsk Skogind.* 6 (4), 1952 (102–9). [Nor.e.] P.R.

Lengths for floor joists, rafters and tie-beams, interior sheathing and exterior vertical siding are given in graphs showing the desirable % distribution for lengths ranging, in steps of 0·2 m., from 2·2 to 6·6 m. The other dimensions preferred for joists, rafters and tie-beams are $1\frac{1}{2} \times 6$ in. to $1\frac{1}{2} \times 8$ in. and 2×6 in. to 2×8 in. These figures are based on a study by the Building Research Department of the Royal Norwegian Council for Scientific and Industrial Research.

723. **T.D.A. Standard industrial truss type 'A'.** *Design Sheet Timb. Developm. Ass., Lond.* Nos. 13 and 14 [1952]. pp. 3 each. P.R.

The fifth and sixth of a series of design sheets for timber roof trusses suitable for industrial and commercial buildings. They will cover clear spans up to 57 ft. 4 in. where no ceiling is required. Notes are given on loading, construction and adaptation.

724. **T.D.A. Standard industrial knee braced truss type 'C'.** *Design Sheet Timb. Developm. Ass., Lond.* Nos. 21, 22, 23 [1952]. pp. 3 each. P.R.

Design sheets for timber knee-braced trusses and columns for single-storey buildings with sheeted roofs and either timber cladding or sheeted walls, with notes on loading, construction, and adaptation.

725. **A quick-assembly roof.** *Wood* 17 (8), 1952 (316–7).

The 'punt' system of roofing, designed by Ove Arup and partners, consists of a series of prefabricated boxes or 'punts' made of plywood sides 16 in. deep, a plywood top 3 ft. 4 in. wide to form the roof, and a perforated hardboard ceiling underneath. The boxes are stiffened by light timbers glued to the sides and by timber strips in the corners. A 1-in. blanket of glass wool fixed to the underside of the roof plywood gives a U value slightly better than 0·20. The punts are placed at 6 ft. 8 in. centres on their supports, which leaves a space of 3 ft. 4 in. between adjacent punts. Each space is filled in with a prefabricated plywood panel, resting on ledges provided on the sides of the punts. The units can be made to any reasonable size, but are at present made to fit a 3 ft. 4 in. module, being 3 ft. 4 in. wide and in length increasing by intervals of 3 ft. 4 in. from 10 ft. 0 in. to 23 ft. 4 in. The punts can be supported on any normal construction, but a specially designed timber frame has been evolved, consisting of plywood box beams with ledges bonded on either side to support the punts. The roofing system is illustrated with photographs, sectional plans, elevations and sections.

726. **[The suitability of Wallaba for flooring.]** *Rep. For. Dep. Brit. Guiana 1950*, 1951 (9).

Detailed tests indicated that, with properly designed saw teeth, the main difficulties of sawing can be overcome, while the behaviour of the Wallaba [*Eperua* spp.] under subsequent seasoning, machining, and abrasion tests was most satisfactory.

727. **The maintenance of escalator treads.** *Wood* 17 (8), 1952 (301–3).

Discusses the nature of the wear on the treads (the majority of which are of Rock Maple), the cost of maintenance and repairs, and the properties needed in any substitute material.

834. *Shingles. Cooperage. Packing Containers*

728. HYLER, J. E. **Veneer container production.** *Sth. Lumberm.* 185 (2312), 1952 (51 . . . 64, 70).

Describes methods and machinery.

729. KOKTAVY, V. **Improvements in or relating to machines for forming barrel staves.** *Brit. Patent* No. 677,479, Aug. 13, 1952. pp. 3 + 9 dgms. Price 2*s.* 8*d.* P.R.

Relates to machines for cutting the two longitudinal edges of barrel staves simultaneously by means of rotary cutting tools carried by tiltable arms.

835. *Industrial and Domestic (Utility) Woodware. Toys and Models. Sports and Recreational Goods. Musical, Scientific and Mathematical Instruments. Surgical Uses etc.*

See also Nos. 636, 766.

730. KÜHNE, H. Untersuchungen über einige Eigenschaften des Eschen- und Robinienholzes im

Hinblick auf dessen Verwendung für Werkzeugstiele. **[Investigations on some properties of the woods of Ash and Robinia with reference to their use for tool-handles.]** *Bericht, Eidgenössische Materialprüfungs- und Versuchsanstalt für Industrie, Bauwesen und Gewerbe, Zürich* No. 179, 1951 (5–28). 22 refs. [G.f.e.] P.R.

Comparative tests of the two woods have been made on small clear specimens having a cross-section of 1·25 × 1·25 cm., which can be taken from small or broken tool-handles. With certain reservations concerning the growth rate of the wood, the methods have proved useful. It was confirmed that macroscopic inspection of Ash is not sufficient to eliminate wood liable to fail in impact bending, even if other properties (specific gravity, annual ring width, colour) are taken into consideration. The impact bending strength of both Ash and Robinia decreases rapidly—much more so than the static bending strength—with increasing slope of grain, even for small angles of slope. Robinia shows a higher sp. gr. and less dispersion of values, hence it is more suitable than Ash for handles of hammers, axes, and similar tools.

731. LIMAYE, V. D. **Timber for sports goods. Interim report on the strength of timber from Mulberry plantations.** *Indian For.* 78 (7), 1952 (371–5).

Wood from young, fast growing plantations of *Morus alba* in the U.P. and the Andamans was tested and found to have strength properties suitable for the manufacture of sports goods. *M. laevigata* from Assam was also found to be suitable, though it has a somewhat lower impact strength. Test data are tabulated.

732. PERRY, T. D. **Types of plywood. Part 10. Plywood in musical instruments.** *Wood Wkg. Dig.* 54, 1952 (139–42, 144, 146). P.R.

The use of plywood for pianos, cabinet organs, electronic organs, stringed and percussion instruments, radio and television cabinets, and instrument cases.

733. VENET, J. Les instruments de musique et le bois. I. Violons et violoncelles. II. Pianos. **[Musical instruments and wood. I. Violins and cellos. II. Pianos.]** *Rev. Bois Appl.* 7 (6), 1952 (5–9). [F.]

734. MICHELMAN, J. **Chladnian movement in the wood of violins.** *Ohio J. Sci.* 50 (5), 1950 (235–8). 5 refs. C.G.B.

In order to investigate the effects on tonal properties obtained by applying linseed oil to unvarnished violins, mineral oil was applied by brush to the exterior of such a violin, which was then played at intervals for periods of 15 min. Each time, patches of oil appeared after playing on the same 4 places on the back of the violin, but were reabsorbed after some hours. After 4–5 days, however, the patches failed to reappear after playing. Similar results were obtained when the experiments were repeated 3 times during the next 18 months. No oil appeared on the front of the violin, which was of softwood. The appearance of the patches of oil is attributed to vibration in the cell structure of the wood; as the oil thoroughly permeates the cells this response to vibration is reduced and the movement of the oil in the wood ceases. [Cf. *For. Abstr.* 13 (Nos. 4302–3).]

836. *Furniture and Cabinet-Making. Carving. Marquetry. Wooden Ornaments*

735. **Quality standards for furniture.** *Wood* 17 (7), 1952 (284–5).

A brief illustrated account of the research programme of the Furniture Development Council's Research Department at Redhill, Surrey.

838. *Vehicles (including Ships, Boats, Aircraft)*

See also No. 696.

736. ODA, M. **An investigation into the timber [industry] for railway vehicles [in Japan].** *For. [industr.] Econ., Tokyo* 4 (8–10; 12), 1951 (20–6; 18–23; 23–9; 23–8); 5 (2–4), 1952 (16–9; 20–4; 32–4). Numerous refs. [Jap.]

Describes the industry's history and development, productive capacity and war damage (with data on individual firms); species, grade and quantity of timber consumed for each use category; post-war demand and supply. In the older type of wagons, native woods were used, chiefly *Zelkova serrata*, then *Tsuga sieboldii* and *Chamaecyparis* spp., with only a little Teak; in the newer type, 'American Pine' predominates, then *Quercus crispula* and only a little *Z. serrata*. Tables show in detail the uses to which these different woods are put in each type of vehicle.

737. **Plywood grain door developed.** *Timberman* 53 (8), 1952 (124).

A light-weight stressed-plywood door for railway wagons carrying grain has been developed by the Wood Products Co., Portland, Ore. The door is in 3 horizontal sections, each 2 × 7 ft. It is made of $\frac{5}{16}$-in. unsanded, exterior-sheathing-grade plywood with no core. Plywood panels are put in stress by using centre blocking and gluing the ends together so that each side is convex, thus increasing the flexural strength. The sections are not nailed to the frame but have end holders so that they can easily be lifted; they are, therefore, not damaged in unloading and can be re-used. Tests by the Oregon State College engineering department showed that the door will stand a pressure of 1700 lb./sq. in., as against 500 lb./sq. in. for ordinary wooden doors. The firm has also developed a light-weight standard interior house door without a core using the same stressed-panel principle in reverse, the panels being glued at the centre into a concave form.

738. KUENZEL, J. G. **Military marine wood usage—marine laminating.** *Proc. U.S. For. Prod. Res. Soc.* 5, 1951 (83–6). 7 refs.

A brief general account, based on the experience of the Forest Products Division, Bureau of Ships, U.S. Navy Department, of woods used for ship and boat building, and of the development of laminated wood for this purpose, including notes on adhesives and laminating technique.

739. WOODS, R. P. **Timber decking on the M.V. Nottingham.** *Quart. Rev. Timb. Developm. Ass.* 3 (6), 1952 (18–9).

Results, to be published in more detail later, of controlled experiments [cf. *For. Abstr.* 12 (No. 1433)] show that all the timbers are standing up to decking conditions, that White Peroba and Iroko are the least suitable because of their dark colour and a tendency to shakes, that African Mahogany and Afrormosia are stable but rather dark in colour, and that White Seraya and Agba are very similar to Teak in their behaviour.

839.8. *Industrial Waste Wood and its Uses*

See also Nos. 370, 597, 847–8, 854.

740. HALLERSTEDT, B. Lastning av sågspån. [**Loading sawdust.**] *Skogen* 39 (6*/7*), 1952 (64*). [Sw.]

Apparatus (illustrated) for loading sawdust into a lorry with high sides consists of a fan attached to the front of the lorry and driven from the engine, a tube 10 in. in diameter running from the drum enclosing the fan to a funnel-shaped hopper through which the sawdust is fed in, and a tube passing from the fan equipment, up over the driver's cabin and down into the lorry, which holds about 28 cu.m. of sawdust. Loading takes about 2 hr. Running costs are small, about 20 öre/cu.m. of sawdust loaded.

741. BELL, G. E. **The handling and transportation of sawmill waste for pulpwood.** *Mimeo. For. Prod. Lab., Can.* No. *O*–164, 1952. pp. 14 + 17 photos, 2 dgms.

742. DONNELLY, R. P., BROADBENT, R., and BRENNAN, L. **Sawdust as a boiler fuel.** *Fuel* 31 (2), 1952 (200–9). [Government Chemical Laboratories, Perth, W. Australia.] D.S.I.R.

The main timbers sawn in Western Australia are Jarrah and Karri. Approximately 12% of the logs sawn is lost as sawdust. The green run of mill sawdust approximates to 40% water and a calorific value of 6000 B.Th.U./lb. (dry calorific value of Jarrah is 8830 B.Th.U./lb.), with a boiler efficiency of 65%. The coal equivalent of 100 lb. sawdust is calculated at 35·8 lb. Dutch oven grates, step grates and spreader stokers firing on to horizontal grates are described with illustrations. The limiting velocity of air through a grate after which the sawdust can no longer lie as a bed on the grate either in compact or fluidized condition and combustion takes place entirely in the combustion space as pulverized firing, has been calculated for green Jarrah sawdust; it ranges from 7300 ft./hr. for a B.S. mesh 8–10, to 1900 ft./hr. for a mesh under 36. Although the small sizes of sawdust blow off the grate more easily, they also burn more easily. No definite data are available for combustion space allowance but the most probable figure is 2½–5 lb. sawdust (40% water)/cu. ft./hr. Bulk densities of sawdust measured appear to show that the weight of a given volume of sawdust increases directly with water content, buzzer chips at 12% water bulking 14 lb./cu. ft. and green sawdust at 38%, 20–22 lb. The steam-raising capacities/cu. ft. were practically identical at 60–70 lb./cu. ft. sawdust. Test results gave evaporations of 3–4 lb. steam/lb. sawdust. Figures showing relation of moisture content of sawdust to efficiency and evaporation, test details and heat balance in sawdust-fired boilers, limiting air velocities for fluidization, and results of a sieve analysis of sawdust 'fliers' are tabulated.

743. LETTS, W. W. **Briquets from sawdust, bark and other waste.** *Proc. U.S. For. Prod. Res. Soc.* 5, 1951 (202–3).

Describes the manufacture, use, and properties of Letts Burnets, cylindrical briquettes 1⅛ in. in diameter, made of shavings, sawdust, bark, or other waste.

744. ALLEN, J. W. **Use of wood fines in gravity feed stoves.** *Proc. U.S. For. Prod. Res. Soc.* 5, 1951 (190–4).

A review of the use of wood fines as fuel in gravity-feed stoves in the Pacific Northwest and a brief discussion of methods of producing wood fines suitable for gravity feeding. *Author's summary.*

745. MILLER, E. C. and HANSEN, G. E. **Spreader stoker firing of wood and coal in multiple fuel furnaces.** *Proc. U.S. For. Prod. Res. Soc.* 5, 1951 (195–201). 6 refs.

Discusses the advantages of spreader stoker firing of wood in combination with other fuels. The design of the stokers, furnaces and auxiliary equipment for multiple-fuel firing is explained. The effect of moisture content of the wood on steam capacity and efficiency is shown. *Authors' summary.*

746. RATNIKOV, E. F. Topka dlja sovmestnogo sžiganija drov i drevesnyh othodov. [**A furnace for simultaneous combustion of firewood and wood-waste.**] *Za Ekonomiju Topliva, Moskva* 8 (5), 1951 (33–4). [Russ.] D.S.I.R.

Illustrated description of a furnace having separate feeds for the two kinds of fuel used, and separate grate systems.

747. DUNN, S., WOLFE, L. P., JR., MACDONALD, W. A., and BAKER, J. R. **Field plot studies with sawdust for soil improvement.** *Plant & Soil* 4 (2), 1952 (164–70). 4 refs.

Field plot tests were undertaken in order to compare the effects of (1) rotted sawdust, (2) fresh sawdust and (3) farm manure, as soil improvers. No significant difference was observed in yields of maize from plots treated with (1) and (2), though there was a slight trend in favour of (1). Heavy applications of fertilizer were necessary for the first 3 years. All the organic materials tended to prevent pronounced fluctuations in moisture.

84. PRESERVATION AND OTHER TREATMENTS TO IMPROVE THE PROPERTIES OF WOOD. DAMAGE BY BIOLOGICAL AGENCIES AND ITS CONTROL. SEASONING. TIMBERYARD PRACTICE

841. *Wood Preservation*

See also Nos. 702–3, 770–1, 779–80, 788–90, 794–5, 846

748. **List of publications on wood preservation.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*704, 1951. pp. 29. P.R.

749. NEARN, W. T., and KERSTETER, A. **Table top wood treating plant.** *Progr. Rep. Pa. agric. Exp. Sta.* No. 75, 1952. pp. 3.

Describes the design and construction of a wood-preservation plant of small size, at the Pennsylvania State College School of Agriculture.

750. MARSDEN, D. H. **Preparation of slide-mounts to study distribution of preservative material in wood.** *Phytopathology* 42 (6), 1952 (300).

Thin sections of preservative-treated wood are cut with a sliding microtome in the usual manner. One or more sections are immersed in water in a small bottle fitted with a tight rubber stopper and glass tube for attachment to a vacuum pump. The bottle is evacuated for 3–4 min., sufficient to remove most air bubbles from the sections, which may then be mounted directly in dark Karo corn syrup. The corn syrup is miscible with water, so that there is no need for previous dehydration. Excess water evaporates from under the cover slip, leaving the section embedded in a thin film of solid, crystal-free corn syrup. The refractive index of Karo is favourable for both microscopy and photomicrography.

751. BLEW, J. O., RICHARDS, C. A., and BAECHLER, R. H. **Evaluating wood preservatives.** *Proc. U.S. For. Prod. Res. Soc.* 5, 1951 (230–8). 38 refs.

A review of laboratory tests of permanence (volatility, leachability, stability), penetration, safety in use, effects on wood and metal, fire retardance, paintability, water repellence, and toxicity (malt-agar, wood-block, and soil-block tests). Notes are also included on accelerated field tests and service tests.

752. FINHOLT, R. W., WEEKS, M., and HATHAWAY, C. **New theory on wood preservation.** *Industr. Engng. Chem.* 44 (1), 1952 (101–5). 10 refs. P.R.

Comparative toxicity tests were made on a series of normal alcohols and amines in an aqueous medium (malt/agar) and in wood (Leutritz soil-block method), using *Lentinus lepideus* as the test fungus. Results support the authors' hypothesis that fungitoxic materials fall into two classes differing in mode of action: (1) 'Interior fungitoxics', acting inside the fungus cell. For these, solubility in water is one requirement, but molecular size is also shown to be concerned: the active materials are limited to a maximum carbon chain length of ca. 12, larger molecules being apparently unable to pass through the cell wall of the hyphae. (2) 'Exterior fungitoxics', acting outside the fungus cell, possibly by denaturing the hydrolases excreted by the hyphae, and so preventing rot in wood, though ineffective in malt/agar where no hydrolytic activity outside the cell is necessary. These may be soluble or insoluble in water and are not limited in activity by their chain length.

753. SANDERMANN, W., FROEDE, O., and CASTEN, R. Über den Mechanismus der Sublimatfixierung an der Holzfaser. **[The mechanism of the fixation of $HgCl_2$ on wood fibres.]** *Holz Roh- u. Werkstoff* 9 (12), 1951 (456–60). 27 refs. [G.g.] P.R.

Evidence from a review of literature and from the authors' own experiments indicates that $HgCl_2$ is fixed in wood mainly by forming additive compounds with the side chain of lignin. These are broken down again in acid media, yielding soluble Hg compounds. Microscopic tests, using Friesen's reaction, also confirm this view, the maximum concentration of Hg being found in and adjacent to the lignin-rich middle lamella. The facts are against the view that $HgCl_2$ is fixed by reduction to Hg_2Cl_2. A small proportion of the Hg is, however, more strongly bound and cannot be removed in acid media. This fraction is possibly present as Hg_2Cl_2, and Hg_2Cl_2 has been detected in some quantity near the surface of Kyanized wood exposed to light.

754. THEDEN, G. Über die Tiefe der Wirksamkeit einer Holzschutzbehandlung mit Quecksilberchlorid. 1. Mitteilung aus dem Materialprüfungsamt Berlin-Dahlem über Quecksilberchlorid als Holzschutzmittel. **[Depth of the protective effect of $HgCl_2$ as a wood preservative. 1st report from the Materialprüfungsamt Berlin-Dahlem on $HgCl_2$ as a wood preservative.]** *Holzforschung* 6 (1), 1952 (1–6). 15 refs. [G.g.e.] P.R.

The depth of the protective effect varies with the susceptibility of the fungi involved. 'Protected-depth' values determined by biological tests are compared with penetration values determined by chemical methods. In a Spruce pole impregnated by the open-tank process, the zone protected against attack by *Coniophora cerebella* was only slightly wider than that indicated by the $(NH_4)_2S$ reaction; with more susceptible fungi the protection zone was much wider. The chemical CuI-paper method gave penetration values comparable to the protection values for $HgCl_2$-susceptible fungi.

755. THEDEN, G., and ENGELBRECHT, G. Chemische Verfahren zum Sichtbarmachen von Quecksilberchlorid im Holz. 2. Mitteilung aus dem Materialprüfungsamt Berlin-Dahlem über Quecksilberchlorid als Holzschutzmittel. **[Visual chemical tests for $HgCl_2$ in wood. 2nd report from the Materialprüfungsamt Berlin-Dahlem on $HgCl_2$ as a wood preservative.]** *Holzforschung* 6 (1), 1952 (6–9). 7 refs. [G.g.e.] P.R.

Presents results of experiments on the technique, sensitivity, and practical value of two visual chemical tests for $HgCl_2$ in wood, viz. the old method using $(NH_4)_2S$, and the newly developed CuI-paper method. The latter is the more sensitive of the two, and it is a good basis for estimating the depth of protection afforded by $HgCl_2$ against many fungi. The sensitivity of the CuI-paper method is given as 0·006% $HgCl_2$ in wood.

756. THEDEN, G., and BECKER, G. Versuche über Abgabe und Wirkung von Quecksilberchlorid in Dampfform. 3. Mitteilung aus dem Materialprüfungsamt Berlin-Dahlem über Quecksilberchlorid als Holzschutzmittel. **[Tests on the liberation and effect of $HgCl_2$ in vapour form. 3rd report from the Materialprüfungsamt Berlin-Dahlem on $HgCl_2$ as a wood preservative.]** *Holzforschung* 6 (1), 1952 (9–12). 10 refs. [G.g.e.] P.R.

Presents results of tests showing that, although the vapour pressure of $HgCl_2$ is only 0·00003 mm. at 20°, the growth of fungi (*Merulius lacrymans domesticus*) and of the newly hatched larvae of insects (*Hylotrupes bajulus*) was distinctly inhibited at some

distance from $HgCl_2$-treated wood. Vapour of $HgCl_2$ from treated wood has also been found to condense in untreated wood specimens, the amount of condensate increasing with increasing concentration of $HgCl_2$ in the treated wood, time of exposure, and proximity to the treated wood.

757. RUBENS, E. Estudio sobre la impregnabilidad y penetrabilidad de las maderas chilenas al tratarlas con agua y soluciones acuosas. **[A study of the impregnation properties and penetrability of Chilean timbers treated with water and aqueous solutions.]** *Industria y Química, Buenos Aires* 12 (2), 1950 (40–2, 45). [Span.] D.S.I.R.

A report on experiments carried out at the Universidad Técnica Federico Santa Maria de Valparaíso to find (1) the volume of water or aqueous solutions absorbed by certain timbers, and (2) the depth of penetration of the liquid. For (1) the timbers were immersed in the solutions. For (2) the hot-and-cold-bath method was used, (*a*) with 1 tank and (*b*) with 2 tanks. The results are presented graphically. The timbers tested were Olivillo [*Aextoxicum punctatum*], Tepa [*Tipuana tipu*?], Laurel [*Laurelia sempervirens*], Coigüe [*Nothofagus dombeyi*], Roble [*Nothofagus obliqua*], Tineo [*Weinmannia trichosperma*], Mañío [*Podocarpus* sp.], Lingue [*Persea lingue*] and Luma [*Amomyrtus luma*]. In some experiments Raulí [*Nothofagus pumilio*], Ulmo [*Eucryphia cordifolia*], and Canelo [*Drimys winteri*] were also included.

758. **Practical methods of increasing the utility of wood.** *Carib. For.* 13 (1), 1952 (19–21, 42–4). [E.Span.] (*Rep. U.S. trop. For. Exp. Sta.* 12 [1951?].)

[Cf. *For. Abstr.* 13 (No. 1641).] Work during 1951 centred on the following projects: (1) A study of the penetrability of certain timbers by cold soaking. A table is presented of absorption by 10 species after soaking for 120 hr. in a 5% solution of pentachlorophenol in diesel oil. (2) Tests of treated posts and of durable timbers. (3) Tests of posts of *Eucalyptus robusta* and *Inga vera* treated by the end-diffusion method. (4) Charcoal yield in relation to wood volume. (5) The effects of felling season on the durability of posts.

759. **New vacuum seal penta treatment.** *Timberman* 53 (9), 1952 (92, 94).

The vacuum sealer unit has been developed jointly by the Wood Treating Chemical Co., St. Louis, Mo., and Carr, Adams and Collier Co., Dubuque, Ia., and is used for treating sash, frames and other millwork with pentachlorophenol preservative. The treatment involves an initial vacuum, a shorter dipping period than in the old open-tank treatment and a final vacuum, and leaves the wood dry as it emerges from the unit. The plant is available in several sizes, and consists of a 2-section vertical treating vessel, millwork cage, and auxiliary units and controls.

760. **The preservation of pitwood.** *Colliery Guardian, London* 183 (4738), 1951 (709). L.S.

Description of a film 'Pitwood preservation', on pressure treatment with the water-soluble preservatives 'Wolman Tanalith'. Compression and fire tests on untreated, creosote-treated and 'Tanalised' props are also described.

761. **Preservative treatment of rail sleepers.** *Aust. Timb. J.* 18 (3), 1952 (183 . . . 189).

Preliminary tests show that in heartwood of most *Eucalyptus* spp. the required penetration and absorption of preservative could be obtained at treating pressures of up to 1000 lb./sq. in. A high-pressure pilot cylinder used by the Division of Forest Products is of welded construction, 26 in. in diameter, 12 ft. long, with a wall 1 in. thick. A batch of 50 sleepers each of Jarrah, Karri and Marri has been treated successfully.

762. WYRZYKOWSKI, W. Uzupełniające badania nad przydatnością impregnowanego drewna bukowego do wyrobu podkładów kolejowych. **[Further investigations on the suitability of Beech timber for the manufacture of railway sleepers.]** *Sylwan* 96 (2), 1952 (223–6). [Pol.]

Presents results of tests on the NaF content of NaF-impregnated Beech sleepers. Tests were carried out on the end and central parts of the sleepers, and on the outer zones (sound sapwood), false heartwood, and true heartwood. Comparative tests with timber from the Carpathians (where Beech suffered severely from the 1928–29 frosts) and north-west Poland (where not much frost damage occurred) showed that the false heartwood due to the 1928/29 frosts did not affect the ability of the timber to absorb the preservative across the section of the sleeper.

763. GURD, J. M. **The use of pressure treated wood for structural purposes.** *B.C. Lumberm.* 36 (8), 1952 (72–3, 78–80).

Examples of estimated savings and some records of long life of treated timbers are discussed, and figures showing safe loads of plank and laminated floors, and preservation requirements for piling, caps, stringers and deckers, timber in contact with the ground or exposed to wet, and timber dry and semi-protected, are tabulated.

764. HARRIS, W. V. **A note on wood preservatives for termite control.** *E. Afr. agric. J.* 17 (3), 1952 (109–10).

Three proprietary preservatives [not specified] gave variable but inadequate protection against soil-dwelling termites, when they were applied by dipping. A DDT miscible oil emulsion (17% DDT) used for comparison gave complete protection for 2 years, though it did not prevent some decay. The same 3 preservatives and a fourth one, however, all gave good results when applied by the hot-and-cold method. Slight differences in efficiency were observed, which would probably increase with time. [Cf. *For. Abstr.* 13 (Nos. 1661–3).]

765. PLATH, E., and SCHMIDT, H. Zur Frage der Termitensicherung von Sperrholz. **[Immunization of plywood against termites.]** *Holz Roh- u. Werkstoff* 10 (6), 1952 (250–1). [G.g.] P.R.

General information on termite damage, introduction of preservatives into plywood, suitable preservatives, and the effect of Na pentachlorophenate on plywood glues.

842. *Treatments to Improve the Resistance of Wood to Physical and Chemical Agencies other than Fire*

See also No. 4258.

766. **Forming dies made of densified wood.** *Modern Metals, Chicago* 8 (1), 1952 (34). L.S.

Describes dies for deep and shallow drawing of aluminium parts, made of 'Hi-Den', a material built up of many thin wood veneers dried, impregnated with Bakelite liquid phenolic resin, dried in a heat cycle, and finally cured in a heat-and-pressure cycle that reduces the material to about ½ its original thickness. By varying the resin content and conditions of treatment, it is possible to obtain materials with tensile strength varying between 15,000 and 40,000 lb./sq. in., modulus of rupture between 20,000 and 46,000 lb./sq. in., and Izod impact from 3 to 8·5 ft. lb./in. 'Gaugewood' is a similar material made by another American company.

767. Vom Biegen des Holzes—Patentbiegeholz. **[Wood bending—'Patentbiegeholz'.]** *Holztechnik* 32 (2), 1952 (56–7). [G.] P.R.

Describes a new wood product made in Germany from Oak, Beech, Ash, Cherry, or Walnut, in lengths of 60–165 cm. and sections of 10 × 12 cm. and 10 × 25·5 cm., which can be hand bent like lead, cold and without pretreatment, to a radius of curvature 10 times its own thickness, and sets permanently after a short exposure to a temperature of 60–70° C. If a smaller radius of curvature is required the material can be sawn into thinner laminae which are then bent and glued. It can be machined like ordinary wood, is free from chemicals, and so can be stained, polished etc. Before bending it must be stored in a cold room.

843. *Fireproofing and Fire Resistance*

768. PURUSHOTAM, A., and JAIN, J. C. **Protection of timber, grasses and textiles against fire.** *Indian For.* 78 (6), 1952 (299–300). 4 refs.

Preliminary data on experiments carried out at Dehra Dun with two fireproofing agents: (1) a combined preservative and fireproofing treatment with a mixture of H_3BO_3 (3 parts by weight), $CuSO_4$ (1 part), $ZnCl_2$ (5 parts) and $Na_2Cr_2O_7$ (7 parts); and (2) a fireproof paint composed of ashes (25 parts by weight), mica powder (25 parts), borax (15 parts), asbestos powder (10 parts), ZnO (10 parts), Tamarind seed powder (10 parts) and gum arabic (5 parts). Both gave good results on wood (*Bombax malabaricum* and *Pinus excelsa*) and also with textiles.

769. **New method of fireproofing timber.** *Timber News* 60 (2156), 1952 (286). P.R.

Results of tests carried out by the Department of Scientific and Industrial Research and the Fire Offices' Committee, Joint Fire Research Organisation, have shown that Albi-'R' [cf. *For. Abstr.* 7 (No. 1937); 8 (No. 496)] used on insulating board, hardboard, Douglas Fir plywood and Gaboon plywood gave a surface of very low flame spread (Class I under B.S. 476:1932).

844. *Attack by Plant Organisms*

844.1. Sap-staining Fungi

See also Nos. 421, 511, 820.

770. CONKLIN, D. B. **The development and prevention of sapstain in softwoods.** *Sth. Lumberm.* 185 (2312), 1952 (42–3).

Discusses water and oxygen requirements, stain in relation to wood structure, the distribution and spread of fungi, and preventive treatment.

771. HOF, T. Het optreden van blauw in hout. **[The occurrence of blue stain in wood.]** *Circ. Houtinst. T.N.O.* No. 16, 1952. pp. 20. 70 refs. [Du.e.] Price *Fl.*2·50. P.R.

A discussion, based mainly on literature, of the cause of blue stain, the temperature and moisture requirements of the fungus, and its effect on the cell walls, the mechanical and physical properties, durability and acceptability of the timber, and preventive measures.

772. FRITZ, C. W. **Brown stain in Pine sapwood caused by *Cytospora* sp.** *Canad. J. Bot.* 30 (4), 1952 (349–59 + 9 photos). 1 ref. P.R.

A fungus isolated from naturally brown-stained Red Pine sapwood was found to produce characteristic chocolate-brown stain in sterilized Red Pine sapwood in culture; it is identified as a species of *Cytospora*. The fungus develops in the ray parenchyma, may proliferate in the tracheids, but penetrates the walls only through the pits. A technique is described for producing brown stain in culture in sticks of the size required for static bending and toughness tests. Two series of sticks were subjected to each test; the samples used were end-matched sticks in groups of three, which provided a green control, sterilized control, and specimen stained in culture by *Cytospora* sp. The results showed some variation in the relative strength of samples in different groups, but a statistical analysis indicated that the effect of *Cytospora* sp. on both bending strength and toughness is negligible. *Author's summary.*

844.2. Wood-destroying Fungi

See also Nos. 72, 421, 430–6, 658–9, 719.

773. HOF, T. Aantasting van hout door schimmels. **[Damage to wood by fungi.]** *Circ. Houtinst. T.N.O.* No. 15, 1952. pp. 28. 95 refs. [Du.e.] Price *Fl.*2·50. P.R.

A survey of literature.

774. JACQUIOT, C. Essais préliminaires de conservation sous huile minérale de cultures de Basidiomycètes. **[Preliminary tests in the preservation of cultures of Basidiomycetes in mineral oil.]** *Revue de Mycologie, Paris* 16 (1), 1951 (27–9). 13 refs. [F.] [Laboratoire Central d'Essais des Bois, Paris.] G.U.

Cultures of *Polystictus versicolor* and *Armillaria mellea* were kept for 6 months, and cultures of these

species and of *Merulius lacrymans* for 14 months, in mineral oil, after which they were planted out on malt agar. *P. versicolor* and *M. lacrymans* developed normally after 14 months, *A. mellea* developed after 6, but not after 14 months in the oil. [Cf. *For. Abstr.* 13 (No. 4330).]

775. Villey, M. Influence de la méthode de conservation des souches de *Coriolus versicolor* sur l'attaque du bois par ce champignon. **[The effect of methods of preserving cultures of *Polystictus versicolor* on the attack of this fungus on wood.]** *Revue de Mycologie, Paris* 16 (1), 1951 (30–2). [F.] [Laboratoire Central d'Essais des Bois.] G.U.

Tests made with *P. versicolor* on Beech wood with cultures preserved (*a*) in mineral oil for 10 months, (*b*) by successive cultures for 10 months, demonstrated that: (1) cultures (*b*) left for 6 months without reculturing, until the mycelium was apparently desiccated, showed a slight delay in growth when recultured, but no diminution in destructive power; and (2) cultures (*a*) appear to have a slightly increased power of destruction. [Cf. *For. Abstr.* 13 (No. 4330).]

776. Truman, R. **X-ray pole inspection.** *Tech. Notes For. Comm.* (*Div. Wood Technol.*) *N.S.W.* 5 (3), 1952 (12–3). 2 refs.

In tests on 33 poles condemned by timber inspectors, 9 were found by X-ray to be sound, 11 were considered to contain 60–100% sound wood and to be suitable for retention, and 7 to contain 40–60% sound wood; these last should be removed. The method can only be used for poles not embedded in concrete. A trench is dug 12 in. wide and about 6 ft. long, sloping from ground level at the X-ray tube to about 8 in. deep at the pole. The examination is made on the portion of the poles 7½ in. below and 7½ in. above the ground. The method should be used not to replace visual inspection, but as a check on the condition of poles condemned by inspectors. [Cf. *For. Abstr.* 3 (55); 11 (No. 2817); 14 (Nos. 430, 711).]

777. Narayanamurti, D., George, J., and Verma G. M. Säureproduktion der Pilze. **[Production of acids by fungi.]** *Holz Roh- u. Werkstoff* 10 (6), 1952 (18–20). 10 refs. [G.g.] P.R.

Presents results of an investigation on the production of acids by *Polystictus sanguineus* in malt solution, malt agar, peptone, and wood, by *Fomes lamaoensis* in malt solution and peptone, and by *Lenzites saepiaria* in malt solution. The pH of the media first decreased, then increased again but did not reach its initial value. The lowest pH value, 3·08, was observed for *Polystictus sanguineus* on peptone. *Lenzites saepiaria* on malt solution produced very little acid. Among the products of *Polystictus sanguineus* on wood, formic acid and butyric acid were found. *From authors' summary.*

778. Scheffer, T. C., and Englerth, G. H. **Decay resistance of second-growth Douglas-Fir.** *J. For.* 50 (6), 1952 (439–42). 13 refs.

Graveyard tests showed that the decay resistance of second-growth Douglas Fir wood from a number of sites was for the most part moderate, but not inferior to that of virgin-growth wood. The larger differences in resistance appeared to be of genetic origin.

844.4. Control and Prevention

See also Nos. 752, 770–1.

779. Keino, K. **Effects of copper salts upon the mycelial growth of wood-destroying fungi. I. On the formation of 'the accumulating zone' of copper oxalate.** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 44, 1950 (71–90). 11 refs. [Jap.e.]

The effect of 0·4% $CuSO_4$ and 1% and 3% CuO on mycelial growth was tested by the agar spot-plate method, using chiefly *Poria vaporaria*, but also *Aspergillus niger* and *Penicillium* spp. With *P. vaporaria* the mycelia grew over the Cu-impregnated agar but formed concentric rings which were associated with the accumulation of Cu oxalate. The presence of $Ca(OH)_2$ did not prevent these rings from developing. With *A. niger* and *Penicillium* only a single accumulation zone was formed. No mycelial growth on Cu-impregnated agar was observed unless the central spot was kept Cu-free for initial growth.

780. Verrall, A. F., and Mook, P. V. **Research on chemical control of fungi in green lumber, 1940–51.** *Tech. Bull. U.S. Dep. Agric.* No. 1046, 1951. pp. 60. 16 refs. [Bureau of Plant Industry.]

Results of tests on a large number of chemicals and commercial preparations are tabulated and discussed.

781. McGovern, J. N., Martin, J. S., and Hyttinen, A. **Effect of storage of Slash Pine pulpwood on sulfate and groundwood pulp quality.** *Proc. U.S. For. Prod. Res. Soc.* 5, 1951 (162–8). 6 refs.

Presents results of tests on the amount of decay, density, chemical composition and other properties of representative samples of Slash Pine cut in October 1948 and stored, both barked and unbarked, in a wood yard at Bogalusa, La., for periods of 4, 6, 9, and 12 months [cf. following abstract], and of pulping tests on this wood. The barked wood showed a considerable amount of decay and a small decrease in density after 4 months' storage, but further deterioration was slight. The unbarked wood deteriorated progressively throughout the 12 months, the total loss of wood substance being 14% of the green weight. Loss of lignin, holocellulose, and α-cellulose was roughly proportional to the loss in density. Sulphate pulping characteristics were almost the same for green and stored, barked or unbarked wood, but pulp yield per cu. ft. wood decreased in the same proportion as did density, and pulps from both types of stored wood had lower strength properties than those from sound, green wood, the greatest strength losses occurring in unbarked wood stored for 12 months. In the groundwood pulp, the principal effect of wood storage was a decrease in brightness, and no important differences existed between green and stored wood in grinding rate, energy consumption, fibre length distribution or pulp strength.

782. Lindgren, R. M. **Deterioration of Southern Pine pulpwood during storage.** *Proc. U.S. For. Prod. Res. Soc.* 5, 1951 (169–81). 5 refs.

Gives the results of a study of Slash and Loblolly Pine both cut and stacked in July and October 1948 and May 1949, in the rough or barked, in a wood yard at Bogalusa, La., and sampled at intervals during a year of storage for sp. gr., moisture content, and decay and sapstain. The following conclusions are drawn: (1) Losses in sp. gr. of 3–5% can be expected within ca. 2 months of summer and 5–6 months of autumn and winter storage in this region. (2) Within these storage periods, rough bolts are likely to show less deterioration than barked ones, but with longer storage there will be a progressive advantage from barking. (3) Season of storage is important for storage periods under 9 months; within such periods autumn storage will reduce losses appreciably. (4) Measures attempting to reduce deterioration by hastening drying hold no promise for rough, but are important for barked wood. (5) Deterioration will be reduced in rough wood by autumn storage for periods up to 9 months, favouring large bolts which should be as long as possible; for barked wood suitable measures include hastening drying by proper stack ventilation, favouring small bolts or splitting the bolts for storage.

The most prevalent decay was caused by *Peniophora gigantea*, which attacked both cellulose and lignin; after 6 months *Lenzites saepiaria*, which destroys chiefly cellulose, became increasingly important. [Cf. preceding abstract.]

783. CARTWRIGHT, K. St. G., and FINDLAY, W. P. K. **Dry rot in wood.** *Bull. For. Prod. Res., Lond.* No. 1, 5th ed., 1952. pp. 36 + 9 photos. Price 2*s*.

The bulletin has been thoroughly revised particularly in the section dealing with the sterilization of infected walls. [Cf. *For. Abstr.* 7 (No. 1230).]

845. *Attack by Animals*

845.2. Terrestrial Borers

784. Splintholzkäfer (Lyctidae). **[The Lyctidae.]** *Holz Roh- u. Werkstoff* 10 (7), 1952 (297–8). 9 refs. [G.] P.R.

An account of the distribution, biology, and natural enemies of the beetles, recognition of the beetles and their attack, and methods of control.

785. **[Nutrition of *Lyctus brunneus* larvae.]** *Rep. Commonw. sci. industr. Res. Organ. Aust. 1950/51*, 1951 (66).

Successful development can take place on a diet in which the carbohydrate/protein ratio is as high as 15/1. The normal ratio in wood is 3·3/1.

786. HARRIS, E. C. **A note on *Criocephalus ferus* Muls. (Col., Cerambycidae, Aseminae) in French Maritime Pine, *Pinus pinaster* Aiton.** *Ent. mon. Mag.* 88 (1058), 1952 (145–7 + 1 plate). 8 refs. [Forest Products Research Laboratory, Princes Risborough.]

Wood-boring insects in Maritime Pine, imported into Great Britain from Bordeaux in 1951, were identified as *Criocephalus ferus*. This unusual type of damage, which was severe, had originated in the tree or log, the timber having been salvaged from logs damaged by fire during the 1949 outbreak. The beetle is known to thrive in coniferous areas that have recently been burned. Notes are presented on the habits of the pupating larvae as observed in the sawn timber.

787. JOVER, H. Note préliminaire sur les modalités de l'attaque du bois d'Avodiré (*Turraeanthus africana* Welw. Pellegrin) par différents coléoptères xylophages en Basse-Côte-d'Ivoire. **[Preliminary note on the circumstances of attacks on Avodiré by wood-destroying beetles in the Lower Ivory Coast.]** *Rev. Path. vég.* 30 (1), 1951 (54–5). [F.] I.M.I.

The attractive power (calculated on the basis of density of entry holes of 9 species of Platypodidae and 13 of Scolytidae in 6 months after felling per unit of surface) of untreated logs felled in September, was 0 for squared logs, 1 for barked logs and 10 for logs with the bark; corresponding figures for logs treated with boiling water for 48 hours were 0, 1 × 6 and 10 × 8. Avodiré felled in April was attacked only $\frac{1}{3}$ as much as that felled in September. Tests showed that starch was present in large amounts in the bark and in smaller amounts in the sapwood, and was absent from the heartwood. These facts suggest that: (1) there is a relationship between starch content and borer attack, and (2) the boiling treatment, by killing the enzyme responsible for the gradual depletion of starch from the wood, renders the wood more susceptible to attack. The differences in susceptibility of wood felled in April and September can be attributed to differences in the starch and water contents, and to the varying distribution of the beetles at different seasons.

788. HENRARD, P. Étude préliminaire de la faune entomologique et de la protection des bois exploités au Mayumbe. **[Preliminary study of the insect fauna of Mayumbe and the protection of logs and freshly sawn timber.]** *Bull. agric. Congo belge* 43 (2), 1952 (463–80). [F.flem.]

Gives preliminary results of experiments in the protection against borer attack of newly felled logs (*a*) by barking (ineffective) and (*b*) by the use of insecticides, the most effective of which were Pentoxane M.6 (wettable powder with 6% γ-isomer of BHC) and Phenoxane L.20 (emulsion containing 20% γ-isomer of BHC). Experiments were also made with freshly sawn timber stacked under cover and in the open and treated with various preservatives, of which the most effective was ordinary Pentoxol (with a pentachlorophenol base) with the addition of a small quantity of pure γ-isomer of BHC. Timber stored in the open was in all cases attacked less than that under cover. A brief account is given of the borers found in Mayumbe.

789. GRANT, D. F. **Exploitation of timber from Rubber trees.** *Malay. Forester* 15 (3), 1952 (137–9).

A large-scale experiment in the use of timber from overmature Rubber (*Hevea brasiliensis*) trees has been started on Serapoh Estate, where a large building programme is in progress. Rubber trees, when felled, are extremely susceptible to borer attack, but the following method has been found an effective preventive. The trees are cut into logs, brought in to the sawmill, and sprayed with 7½%

Gammexane solution, the same day that they are felled. Conversion takes place soon after the logs are delivered, and the freshly sawn planks are then sprayed with the same mixture as before with the addition of 3 oz. of Santobrite/gal. At the same time, *damar* paste is applied to the ends. The timber should then be thoroughly seasoned: ½-inch to 1-inch boards air-dry in about 2 months when stacked under cover. After planing and cutting by the carpenters, a third application is made, this time of 7½% Gammexane with 3 oz. silicate of soda mixed in each gallon. The strength of the Gammexane solution is greater than would normally be recommended, but the presence of a longicorn beetle, a species of *Guatholea* which was found boring into posts and beams, makes it doubtful whether the strength could be reduced. This beetle had been previously reported only in the dead branches of Rubber trees and little is known about it. It makes holes nearly ¼ in. in diameter, does not attack painted wood, but is not deterred by whitewash to which Gammexane has been added. It has not yet been found in thin boards used for floors and walls.

The best trees for timber are those which have stopped yielding latex. Trees that have been killed by poisoning are no good, because of insect borers. The freshly cut wood is very white but soon turns light pink and darkens considerably if exposed out of doors. It is quite heavy even when dry (ca. 40 lb./cu. ft.) and seems to be tough. It is liable to warping but this can be avoided by careful seasoning. It works fairly well and can quickly be planed to a smooth surface. Planks are somewhat liable to end-checking. It is not resistant to rot without thorough impregnation with a preservative. The cost of building a small labourer's house of Rubber wood was $70·00 compared with $185·00 for the same amount of Meranti.

790. SNYDER, T. E. **Preventing reinfestation by wood-borers after fumigation.** *Pest Control* 20 (5), 1952 (30). P.R.

Spraying of the exposed woodwork with a toxic liquid (e.g. Cu compound with DDT in petroleum oil, or chlorinated phenol with DDT) [concentrations not given] at the rate of 1 gal./100 sq. ft. gives good results.

791. ALLMAN, S. L. **Summary of evidence submitted at Sirex wasp committee of inquiry.** *Aust. Timb. J.* 18 (1), 1952 (20, 22).

Discusses the natural occurrence of Siricid wasps in Australia, interceptions in quarantine, species involved, treatment of infested timbers, present instructions for unloading and treating timber, responsibility for timber treatments and the possibility of Sirex establishment in Australia. [Cf. *For. Abstr.* 13 (Nos. 4347–9).]

792. BROOKES, J. D. **Evidence given before the Sirex Wasp committee.** *Aust. Timb. J.* 18 (1), 1952 (26 . . . 34, 80).

Discusses the epidemic of *Sirex noctilio*, introduced through timber shipments into New Zealand plantations, the association of symbiotic fungi with the insect, and the effect on pulp yield and quality of wood attacked by fungus.

845.3. Termites

See also Nos. 43, 764–5.

793. **[Termite resistance of some Australian timbers.]** *Rep. Commonw. sci. industr. Res. Organ. Aust. 1950/51*, 1951 (64–5).

Tests on a group of timbers showed that they may be arranged in the following order of decreasing resistance: *Syncarpia laurifolia, Eucalyptus paniculata, E. tereticornis, E. crebra, E. grandis* and *E. micrantha.*

794. SHELFORD, V. E. **Termite treatment with aqueous solution of chlordane.** *J. econ. Ent.* 45 (3), 1952 (544).

[Cf. *For. Abstr.* 13 (No. 4352).] Toxicity appeared to be a little greater at the end of 4 years than at the end of 3.

795. HETRICK, L. A. **The comparative toxicity of some organic insecticides as termite soil poisons.** *J. econ. Ent.* 45 (2), 1952 (235–7). 3 refs.

On the basis of more than 5 years' experiments, γBHC and chlordane have been found to be more toxic to the subterranean termite, *Reticulitermes flavipes*, than pentachlorophenol, Na pentachlorophenate, toxaphene, DDT and similar materials. Aldrin, dieldrin, and heptachlor seem very promising on the basis of ca. 2 years' work. *From author's summary.*

847. *Drying* (*Seasoning*)

See also Nos. 643–4, 703, 710.

796. **List of publications on the seasoning of wood.** *Rep. U.S. For. Prod. Lab., Madison* No. *R*446, 1951. pp. 17. P.R.

797. OGURA, T. **Studies on the mechanism of wood drying. (3) On the evaporating rate of moisture in wood.** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 51, 1951 (61–75). 30 refs. [Jap.e.]

Presents the results of experiments on drying 3·5 × 2·5 × 0·15 cm. specimens of Nara [*Quercus crispula*?] wood at a constant rate in successively decreasing relative humidities. Initially, when the wood contains large amounts of moisture, the drying rate is proportional to the vapour-pressure difference, and the proportionality factor (surface evaporation coefficient) is almost constant. When the fibre-saturation point is reached, the drying rate is strongly affected by the relative humidity of air, and it becomes proportional to the vapour-pressure difference *minus* a magnitude termed the evaporating resistance, which is explained by the fact that more heat is necessary to evaporate a given quantity of moisture from wood below than above fibre-saturation point.

798. OGURA, T. **Studies on the mechanism of wood drying. 4. On the effects of surrounding conditions on moisture conductivity.** *Bull. For. Exp. Sta. Meguro, Tokyo* No. 51, 1951 (77–83). 4 refs. [Jap.e.]

Moisture conductivity has been determined for (1) a constant temperature of 50° C. and different relative humidities on both sides of a wood layer 1·5 mm. thick, and (2) a constant vapour-pressure difference (v.p.d. of 5·3 mm. Hg) and different

temperatures on both sides. In (1), the moisture conductivity was at first proportional to the v.p.d., and the straight line passed through the origin; for the later stage of drying, the v.p.d. is to be reduced by the 'evaporating resistance' (cf. preceding abstract). For (2), when the temperature difference between both sides was also constant, the conductivity increased as the absolute temperature increased.

799. Sturany, H. Strömungsfragen beim Trocknen von Holz. **[Problems of [air] flow in wood seasoning.]** *Holz Roh- u. Werkstoff* 10 (5), 1952 (201–7). 3 refs. [G.g.] P.R.

An account of the different problems of flow occurring in wood-seasoning plants. While the amount of air is important for the general heat economy, the air velocity and the boundary layer play a major part in the removal of moisture. The screw-type fan seems to be the best of the usual types. The main task in a seasoning kiln consists in attaining a uniform air distribution in all parts of the stack. Photographs obtained in the so-called water-trough with the use of Al powder show that it is possible, even when abrupt changes of direction are unavoidable, to find a satisfactory solution by using the guiding surfaces of Föttinger-Frey. It is also shown that the understanding and proper use of the laws of flow can help to attain a uniform air distribution and, consequently, a uniform seasoning in the usual kilns even without special aids.

800. Rotnickiĭ, M. A., and Uryšev, N. I. Suška lesa dymovymi gazami v sušile STS-1. **[Drying timber by means of flue gases in an STS-1 drier.]** *Za Ekonomiju Topliva, Moskva* 8 (6), 1951 (22–4). [Russ.] D.S.I.R.

Describes a tunnel-type, continuous-operation drying kiln with a capacity of 75,000 cu.m. converted timber per year, in which drying is effected by the direct action of flue gases. The kiln consists of 14 tunnels 36 m. long, 2·62 m. wide, and 3 m. high. The flue gases are generated in a semi-gas furnace with inclined grates, the draught air being supplied both under and above the grate. The fuel used is wood-waste from the house-factory where the kiln has been set up (sawdust, and small chips with a moisture content of ca. 40%). The flue gases pass through a brick-built cyclone and are introduced by a nozzle injector into the tunnel system, where they are circulated by a fan and maintained at constant temperature by automatic devices. The advantages of this type of timber seasoning are summarized.

801. Goodall, C. **Improvements relating to means for drying timber.** *Brit. Patent* No. 658,647, Jan. 5, 1950. pp. 3 + 1 dgm. Price 2*s.* 8*d.* P.R.

The equipment comprises a drying chamber with a well for water in or beneath its floor, a sub-ceiling situated beneath the main ceiling of the chamber and adjacent to the position occupied by the upper part of the timber stack to be placed in the chamber, a fan situated in the space between the main and sub-ceiling, and heating and cooling means on the opposite sides of the fan. During the drying operation the warm and moisture-laden air is circulated round the chamber by the fan. The action of the fan is to draw air from one of the side spaces in the chamber and discharge it to the other side, thus setting up a transverse flow through the stack. During its flow through the stack the air takes up moisture from the timber at a rate dependent on the moisture content of the air. On leaving the stack the air passes over the cooling coils and is then driven by the fan over the heating coils before entering the stack. The moisture precipitated by the cooling coils falls on to the sub-ceiling and is returned to the well.

802. Société Anonyme des Ateliers de Sécheron. **Improvements in or relating to processes for the seasoning of pieces of timber and device for performing it.** *Brit. Patent* No. 664,924, Jan. 16, 1952. pp. 4 + 3 dgms. Price 2*s.* 8*d.* P.R.

A method of seasoning a length or lengths of timber by applying a sheet of moisture-permeable material to at least part of each of 2 grained surfaces (surfaces extending in the direction of the grain) of each length, allowing the moisture to escape and sheltering the timber from the action of air. A spacing element consisting of layers of corrugated material, separates the layers of timber. Heating may be carried out at temperatures not above 130 or below 60° C., and preferably within the range 90–110°, and is preferably performed by circulating hot air over the timber. The covering sheet may be of papier mâché, asbestos, cork, felt, or any fibrous material. The moisture from the timber passes into the porous material and is carried off in the form of vapour by air circulating freely, without the air coming into contact with the surface of the timber. The surface layer of the timber preserves a humidity not much different from that in the depth of the timber, and the formation of cracks is obviated.

803. Birjukov, V. A. Kamernaja suška drevesiny v električeskom pole vysokoĭ častoty. **[Kiln seasoning of timber in an R.F. electrical field.]** Goslesbumizdat, Leningrad-Moscow. 1950. pp. 102 + 1 dgm. 12 refs. [Russ.] Price *Roubles* 4. X.

A handbook for the technician. Besides theoretical considerations, the author pays special attention to practical problems, particularly to the technology and schedules of R.F. seasoning. The book includes sections on: peculiarities and advantages of R.F. seasoning; R.F.-valve generators for timber seasoning; kilns (chambers) for R.F. seasoning, and technology of chamber R.F. seasoning of converted timber. The technical and economic efficiency of R.F. seasoning is discussed.

804. Fessel, F. Hochfrequenztrocknung von Laubhölzern. Versuchsergebnisse. **[Radio-frequency drying of hardwoods. Results of experiments.]** *Holz Roh- u. Werkstoff* 10 (7), 1952 (280–3). [G.g.] P.R.

Experiments were made with green Oak, 28, 32 and 50 mm. thick, dried by radio frequency in an air-conditioned chamber or at room temperature. Results show that when the initial moisture content of the wood is high, a high wood temperature (90° C.) and a rapid moisture loss (5% or more/hr.) are permissible in the first stage; in the second stage

moisture loss must be reduced to 1–2%/hr. according to wood thickness, and temperature to 80°; when fibre-saturation point is reached a further reduction of temperature to 70° and of moisture loss to 0·75%/hr. for wood 28 mm. and 0·5%/hr. for wood 32 mm. thick is necessary. For wood 28 mm. thick with initial and final m.c. of 90 and 26% respectively the drying took 25 hr., while for wood 32 mm. thick with initial and final m.c. of 86 and 20% the time was 28 hr. Checking first occurred after 25 and 27 hr. respectively.

805. PILLOW, M. Y. **Some characteristics of Brazilian Parana Pine affecting its use in millwork.** *Proc. U.S. For. Prod. Res. Soc.* 5, 1951 (297–302). 6 refs.

Describes the general characteristics of the wood with particular reference to the warping caused by compression wood, reviews laboratory and commercial experience of kiln-drying it at moderate temperatures and by higher-temperature, accelerated schedules, and lists features useful for detecting compression wood.

806. NOERKAMAL, M. T. Droogproeven met *Cedrela mexicana* planken. **[Kiln-drying trials with boards of *C. mexicana*.]** *Rapp. Bosbouwproefsta., Bogor* No. 53, 1952. pp. 8 + 2 dgms. + 3 tbls. [Du.jav.e.]

Kiln-drying schedules are presented for boards 2·2 and 4 cm. thick from an average moisture content of 95% in 2 and 8 days respectively.

848. *Timberyard Practice. Handling and Storage of Timber*

807. GRAHAM, P. H. **Standard lumber trucks used as fork lifts.** *Wood-Worker, Indianap.* 71 (6), 1952 (17, 20). P.R.

An illustrated description of a new lumber hoister which can be mounted on any lorry, to be used in loading and unloading lumber lorries, stacking lumber in the yard, and transporting lumber over the yard. The handling capacity is up to 1700 bd. ft., or up to 14,000 lb. of logs.

808. BROMLEY, W. S. **Improved methods of handling pulpwood.** *Proc. U.S. For. Prod. Res. Soc.* 4, 1950 (142–7). 1 ref. P.R.

An illustrated review of current improved methods, including the use of loading docks, winches, trucks and conveyors for loading and unloading pulpwood logs. The Dixie Logger system of moving pulpwood on pallets is described, and the movement of pulpwood chips is discussed.

85. GRADING OF WOOD AND WOOD PRODUCTS

See also Nos. 597, 817.

809. **ASTM manual on quality control of materials.** *Special Technical Publication, American Society for Testing Materials, Philadelphia, Pa.* No. 15–C, 1951. pp. xii + 127. 8 refs. P.R.

A manual of methods for the statistical analysis and presentation of data, replacing the earlier ASTM manual on Presentation of Data (1933 and 1935), in three parts: (1) Presentation of data—frequency distributions, simple statistical measures, and the concise presentation of the essential information contained in a single set of *n* observations. (2) Presenting the ± limits of uncertainty of an observed average. (3) The control-chart method of analysis and presentation of data, with examples. [Cf. *For. Abstr.* 14 (Nos. 601, 814).]

810. FLEMMICH, C. O. **Food and Agriculture Organization of the United Nations report on the first timber grading school (held in Malaya, January-February 1952).** *Malay. Forester* 15 (2), 1952 (80–8).

852. *Detection, Recognition and Assessment of Injuries and Defects*

See also Nos. 178–9, 342, 394, 435, 647, 730, 762, 805.

811. PILLOW, M. Y. **Effects of tension wood in hardwood lumber and veneer.** *Sth. Lumberm.* 185 (2312), 1952 (44 . . . 49). 4 refs. [Forest Products Laboratory, Madison.]

854. *Grading of Converted Timber*

See also Nos. 721–2, 763.

812. REID, J. S., *et al.* **Grading of hardwoods. 4. South Africa. 5. New Zealand.** *Emp. For. Rev.* 31 (2), 1952 (127–30).

Cf. *For. Abstr.* 13 (No. 2586).

813. BRYAN, J. **The grading of home-grown softwoods.** *Wood* 17 (8), 1952 (300–1). [Forest Products Research Laboratory, Princes Risborough.]

The visual characteristics upon which a tentative grading scheme has been based are rate of growth, slope of grain, wane, knots, position of heart centre or pith, and length of piece. A table is given showing the requirements for each of these in Clear and Grades I, II, and III. These grades will be used in investigating the technical properties of timber from Forestry Commission softwood plantations now maturing. The grading will be based primarily on quality, but strength tests will be carried out on structural sizes, enabling working stresses to be allocated to each grade except III. Figures illustrating the basic stress in lb./sq. in. for Clear, and Grades I and II of Scots Pine, Norway Spruce and Japanese Larch are tabulated.

814. PEARSON, R. G. **Variability of timber and the derivation of design stresses [With an appendix by E. J. Williams: The probability of correctly grouping a species according to its mean.].** *Aust. J. appl. Sci.* 3 (2), 1952 (144–55). P.R.

Two methods are discussed of allowing for the variability of clear timber in deriving design stresses. It is shown that reducing the mean by a fixed percentage is unsatisfactory and that a more rational method is to use a particular probability point of the frequency distribution.

The allocation of a common stress to groups of species is complicated by differences in variability of the species. Grouping according to means is shown to be generally very conservative. Use of a particular probability point is a more satisfactory basis for grouping, but it requires more precise information about the species and hence larger samples for testing. *Author's summary.* [Cf. *For. Abstr.* 14 (No. 809).]

86. PULP INDUSTRIES. CHEMICAL UTILIZATION OF WOOD

861. *Paper and Cardboard Industry (Pulp, Paper, Cardboard, Fibreboards)*

See also Nos. 584, 588–92, 595, 623, 741, 781–2, 792, 808.

815. **Increased production of pulp and paper.** *Report of the 6th Session of the Conference of FAO, 19 November–6 December 1951*, 1952 (67–9). [E.F. Span.]

The Conference recommended that FAO should survey the possibilities of increasing production and transport facilities for pulpwood, and that member governments should encourage measures likely to promote the same ends.

816. **170 keen pulp specialists derive valuable results from international pulping conference.** *Pulp Paper Mag. Can.* 53 (8), 1952 (82–6, 94).

Summarizes a number of papers read at an International Pulping Conference held by the Technical Section of the Canadian Pulp and Paper Association in June 1952, including papers on:—Some properties of lignin in relation to pulping (*C. B. Purves*); diffusion and penetration mechanisms of lignin into wood (*A. J. Stamm*); the preparation of wood for sulphite pulping (*R. de Montigny*); cooking hardwoods with ammonia-base sulphite pulping (*J. C. Benny*); important variables in sulphate pulping (*J. R. W. Grieve*); reactions in the kraft process (*W. F. Holzer*); the mixture of structures in mechanical pulp as a key to the knowledge of its technological properties (*W. Brecht* and *K. Klemm*); problems in groundwood manufacture (*J. Edwards* and *W. B. Campbell*); and chemical pre-treatment in groundwood manufacture (*F. W. O'Neil*).

817. Ralston, J. M., and Klein, M. **Methods of checking wood and chip quality.** *Tappi* 35 (7), 1952 (294–7). P.R.

Describes the procedure for making wood quality counts adopted by an American pulp mill for determining trend in the quality of new receipts and for explaining variations in operations. Each log in a sample is classified according to definitions set up for each of the various types of undesirable wood. Chip size distributions are made with the Williams Standard chip screen. Data from tests on effect of knife angle and knife settings on chip size are included. *From authors' summary.*

818. Holte, T. Barkskadet virke, særlig med henblik på tremassefabrikasjon. **[Bark-stained wood with special reference to the manufacture of groundwood pulp.]** *Norsk Skogind.* 6 (5), 1952 (126–33). 2 refs. [Nor.e.] [Papirindustriens Forskningsinstitutt.] P.R.

Tannin reaction in unbarked or partly barked Spruce during floating gives an outer layer of sapwood largely resistant to sulphite pulping; the extent of this damaged wood increases with temperature above 10–12° C. and with the period in the water [cf. *For. Abstr.* 13 (No. 2588)]. Experiments in mechanical pulping were made on samples of (1) severely damaged wood which had been 3 years in the water, (2) slightly damaged, and (3) sound wood. Since (3) differed from the other two woods in its physical properties, pulps from (1) and (2) were compared with (3) to test the effect of tannin damage on pulp qualities. No significant differences in strength, drainage, fibre fractionation, brightness, and reflection for the visible range of the spectrum were found for the different pulps; nor did the damaged wood yellow more rapidly than sound wood when exposed to ultra-violet rays.

819. Jayme, G., and Wörner, G. Über den Aufschluss von Fichtenholz mit Laugen erhöhten Reduktionspotentials. **[Pulping Spruce wood by means of alkaline liquors with an increased reducing potential.]** *Holz Roh- u. Werkstoff* 10 (6), 1952 (244–9). 5 refs. [G.g.] P.R.

The following effects were observed when $Na_2S_2O_4$ was added in varying proportions to 'sulphate liquor' (containing NaOH, Na_2S and Na_2CO_3) used for pulping wood: milder degradation, accompanied by a higher polysaccharide yield and a higher residual-lignin yield; the degree of cellulose polymerization increased; strength was improved owing to both of the preceding factors; the unbleached pulp was much brighter; the used liquor was no longer 'black liquor' and could be used again; the residual lignin in the cellulose was also brighter and much easier to remove by chlorination and oxidizing agents than 'sulphate lignin'. A theoretical explanation is given of the effect of liquors with an increased reducing potential on the main wood constituents. *From authors' summary.*

820. Hata, K. **Studies on the pulp of Akamatsu (*Pinus densiflora* Sieb. et Zucc.) wood. (IV) The chemical composition of Pine wood grown at different rates and stained by *Ceratostomella* spp.** *Tech. Bull. Kagawa-Ken agric. Coll.* 1 (2), 1949 (21–6). 7 refs. [Jap.e.] A.P.B.

[Cf. *For. Abstr.* 14 (No. 629).] Results of analyses of fast and slow grown, and stained and unstained wood are tabulated. Fast grown wood showed a higher content of cellulose and pentosan and a lower content of ash, lignin, mannan, hot- and cold-water extractives and substances soluble in 1% NaOH; the differences were not, however, large enough to affect pulp quality. There was little difference in chemical composition between stained and unstained wood, and the stain was easily bleached out. *From author's summary.*

821. Hata, K. **Studies on the pulp of Akamatsu (*Pinus densiflora* Sieb. et Zucc.). (V) The effect of caustic soda liquor on Pine wood.** *Tech. Bull. Kagawa-Ken agric. Coll.* 1 (3), 1950 (61–74). 12 refs. [Jap.e.] A.P.B.

Discusses the results of a study on the pulping reaction at 165° C. for various periods of digestion.

822. Hata, K. **Studies on the pulp of Akamatsu (*Pinus densiflora* Sieb. et Zucc.). (VIII) Differences between the digesting action of sodium sulphide and of sodium hydroxide on the wood.** *Tech. Bull. Kagawa-Ken agric. Coll.* 2 (1), 1950 (58–64). 11 refs. [Jap.e.] A.P.B.

823. Hata, K. **Studies on the pulp of Akamatsu (*Pinus densiflora* Sieb. et Zucc.). (X) The difficulty of sulphite digestion varying with the position of**

the sample in the tree. *Tech. Bull. Kagawa-Ken agric. Coll.* 2 (3), 1951 (136–8). 7 refs. [Jap.e.] A.P.B.

The following results were obtained from experimental pulping: (1) Heartwood, knots and abnormally resinous wood from all positions were very resistant to pulping, but sapwood was easily pulped. (2) Difficulty of digestion was not related to the % of alcohol/benzene extract in the wood. *From author's summary.*

824. HATA, K., and SOGO, M. **Studies on the pulp of Akamatsu (*Pinus densiflora* Sieb. et Zucc.). (XI) Bleaching and refining the sulphate pulp (1).** *Tech. Bull. Kagawa-Ken agric. Coll.* 3 (1), 1951 (11–5). 7 refs. [Jap.e.] A.P.B.

825. HATA, K. **Studies on the pulp of Akamatsu (*Pinus densiflora* Sieb. et Zucc.). (XII) The difficulties of sulphite pulping the heartwood.** *Tech. Bull. Kagawa-Ken agric. Coll.* 3 (1), 1951 (16–21). 16 refs. [Jap.e.] A.P.B.

K-base liquor gave the best results; and Na-base liquor was next best. Higher concentrations improved pulping, but even ordinary concentrations gave complete digestion if pulping was prolonged. Pulping was not hastened by adding a small quantity of formalin to the pulping liquor.

826. HATA, K., and SOGO, M. **Studies on the pulp of Akamatsu (*Pinus densiflora* Sieb. et Zucc.). (XIV) The difficulties of sulphite pulping the heartwood.** *Tech. Bull. Kagawa-Ken agric. Coll.* 3 (2), 1951 (111–8). 6 refs. [Jap.e.] A.P.B.

Temperature and chemical conditions at which pulping was most and least difficult were studied.

827. CARDERERA, E. Estudio del *Pinus strobus* L. para su aprovechamiento celulósico. **[Study of *Pinus strobus* for pulping.]** [*Bol.*] *Inst. for. Invest. Exp. Madrid* 23 (60), 1950. pp. 19. [Span.f.e.g.]

The results of chemical and histological investigations are presented, including data on wood density, moisture content and cellulose content, all of which indicate a good pulping species. *P. strobus* has already been planted in the coastal forests of northern and north-western Spain. Its wider use is recommended.

828. BHAT, R. V., and SINGH, M. M. **Indigenous cellulosic raw materials for the production of pulp, paper and board. Part X. Writing and printing papers from *panni* grass (*Vetiveria zizanioides*).** *Indian For.* 78 (6), 1952 (292–8 + specimen sheet). 2 refs. 3 tbls.

Cf. *For. Abstr.* 13 (No. 4373).

829. BHAT, R. V., and KARNIK, M. G. **Indigenous cellulosic raw materials for the production of pulp, paper and board. Part XI. Chemical pulps from *Andropogon contortus*, Linn. (*Kusal* grass).** *Indian For.* 78 (7), 1952 (331–8). 2 refs.

Laboratory experiments showed that satisfactory pulps could be made from this species in mixture with longer-fibred species such as *sabai* grass [*Eulaliopsis binata*]. More chemicals are required when pulping *A. contortus* than *E. binata.*

830. BHAT, R. V., and VIRMANI, K. C. **Indigenous cellulosic raw materials for the production of pulp, paper and board. Part IX. Newsprint grade mechanical pulp from *Sterculia campanulata* (Papita).** *Indian For.* 78 (5), 1952 (222–8). 3 refs.

Laboratory experiments on the production of mechanical pulps from Papita are described. Standard pulp sheets were prepared from 100% mechanical pulp from this species and from a mixture of 70% mechanical pulp and 30% Bamboo bleached chemical pulp. The strength properties of the standard sheets prepared from the mechanical pulp produced under suitable conditions have shown that this wood is a promising raw material for the production of newsprint. The colour of the pulp is also suitable for newsprint. This species is available in the Andamans and the wood is used in the match industry in Calcutta. *Authors' summary.*

831. KLAUDITZ, W., and BERLING, K. Untersuchungen und Feststellungen über die Eignung einiger schnellwüchsiger Holzarten zur Herstellung von Papier, Zellstoffen, Holzfaser- und Holzspanplatten. **[Research and conclusions on the suitability of some fast-growing tree species for the manufacture of paper, pulps, fibreboards and chipboards.]** *Repr.* from *Tagungsbericht des Vereins für technische Holzfragen, Braunschweig, 1951*, 1951 (23–39 + 5 photos, 1 gph.). 19 refs. [G.] P.R.

The woods tested included *Larix leptolepis, Quercus borealis, Liriodendron tulipifera* and *Populus* spp. Results of chemical analyses, pulping experiments and tests on fibre boards are tabulated. *Q. borealis* proved more suitable for pulping than Beech. *L. tulipifera* is good for pulping. Japanese Larch proved suitable for sulphate but not for sulphite pulping. These 3 species are suitable for fibre- and chipboards. Poplar species were considered especially suitable for fibreboards.

832. TYDÉN, H. Björk som råvara vid massaframställning. **[Birch as raw material for pulp.]** *Norsk Skogind.* 6 (6), 1952 (175–9). [Sw.e.] P.R.

Discusses supply and costs in Sweden of Birch for pulping and tabulates figures showing the comparative yield and properties of Pine and Birch sulphate and Spruce and Birch sulphite pulp. [Cf. *For. Abstr.* 13 (Nos. 2596–7).]

833. **The resistance of Black Cherry to sulphite pulping.** *Paper Tr. J.* 134 (22), 1952 (26, 28). P.R.

The physical structure of Black Cherry is probably not the cause of its pulping resistance. It is possible that flavanone-type compounds present in unknown relative amounts and similar to the Douglas Fir flavanone, are responsible.

834. SOMERVILLE, J. L., and BURKITT, J. S. **Physical aggregation of Eucalypt groundwood.** *Proc. Aust. Pulp Pap. Ind. tech. Ass.* 5, 1951 (146–69). 34 refs. P.R.

The strength of the groundwood made chiefly from the wood of *E. regnans* varies greatly within the species, both within the tree and between trees from different sites and of different ages. The strongest groundwood is obtained from near the centre of most old trees (150 to 500 years). Wood lying in the same position in regrowth trees of 12 to 25 years of age from the same areas gives much weaker groundwood, and, unlike that from the old trees,

gives no pink coloration on exposure. *From authors' summary.*

835. DADSWELL, H. E. **The influence of wood structure on the quality of Eucalypt groundwood.** *Proc. Aust. Pulp Pap. Ind. tech. Ass.* 5, 1951 (170–87). 9 refs. (Also as *Repr. For. Prod. Aust.* No. 149).

Two groundwood pulps from *Eucalyptus regnans*, one of which was of lower strength than the other, various fractions from these pulps, and wood samples cut from the billets from which they were made, have been examined. More whole fibres and less fibrillar debris were observed in the stronger pulp and the average length of whole fibres retained on the coarsest screen was greater. It was concluded from the examination of fibre cross-sections that the fibres from the stronger pulp were somewhat less damaged and had fewer breaks across the cell wall. The wood producing the better pulp was derived from sound billets of large trees approximately 370 years old; the average basic density was 33 lb./cu. ft. and the narrow growth rings averaged 13 per in. The wood producing the other pulp was derived from young regrowth trees of pole size 12 to 18 in. d.b.h. and averaging 6 growth rings per in.; the basic density was 30 lb./cu. ft. There was a greater proportion of thicker-walled fibres in the denser, slower grown material and the average fibre length was greater than in the faster grown, young material. The variations observed in radial growth rate, fibre dimensions, cell-wall thickness and density, led to the assumption that in this species good-quality groundwood pulp is correlated with long fibres and thick cell walls. Examination of wood surfaces which had been in contact with the stone showed that, when these were strictly tangential or radial, rupture during grinding occurred mainly in the intercellular zone, the fibres being 'rolled off' the wood. On the other hand, when the surface was at an angle to the rays or growth rings, the rupture occurred more commonly through the cell walls, thus producing more fibrillar debris. The thinner the cell wall the greater was the extent of the cell-wall damage observed. *Author's summary.*

836. WATSON, A. J., and COHEN, W. E. **Chemical composition of Eucalypt groundwood.** *Proc. Aust. Pulp Pap. Ind. tech. Ass.* 5, 1951 (188–200). 9 refs. (Also as *Repr. For. Prod. Aust.* No. 155.)

Good-grinding wood of *E. regnans* has been shown to differ from poor-grinding wood in giving a substantially lower yield of chlorine holocellulose due to loss of non-resistant carbohydrate material. Its lignin has been modified and the pH of its aqueous extract was lower than that of the poor-grinding wood. The changes in the non-resistant carbohydrate fraction and in the lignin were similar to those by very mild hydrolytic treatments. They probably occurred in the middle-lamella zone and consequently could influence the ease with which fibres are separated from the wood during grinding. It is suggested that old trees produced the high-grade groundwood because the acidic conditions prevailing over 200 years or more, influenced the chemical composition and hence the grinding characteristics. There was some modification of the non-resistant carbohydrate material during the production of groundwood from both the good- and poor-grinding wood. This has been attributed to the rupture of the middle lamella and immediately adjacent zones, during grinding, thus exposing relatively non-resistant material to the reagents used in the holocellulose determination. *Authors' summary.*

837. COHEN, W. E., and MACKNEY, A. W. **Influence of wood extractives on soda and sulphate pulping.** *Proc. Aust. Pulp Pap. Ind. tech. Ass.* 5, 1951 (315–36). 9 refs. (Also as *Repr. For. Prod. Aust.* No. 160.)

Presents results of an investigation on the correlations between specified chemical properties of the woods of certain Eucalypts (hot-water solubles, and the consumption of NaOH in the sulphate pulping of *E. sieberiana*, *E. regnans*, and *E. obliqua*, and in the soda pulping of *E. obliqua*, *E. viminalis*, and *E. amygdalina*) and some pulp properties (lignin content, and $KMnO_4$ number). The correlations are represented by regression equations of the type $Y = ax + b$, and $Y = ax_1 + bx_2 + c$. The various correlations, together with their coefficients, are tabulated.

838. CROSSLEY, T. L. **Multi-fibrous hardwood pulp.** *Pulp Paper Mag. Can.* 53 (7), 1952 (126–30). 4 refs.

Orchard waste (i.e. pruned branches from fruit trees) was found to be readily pulped, without removal of the bark, and easily bleached. The pulp contained two types of fibre, a long cotton-like one from the bark, and the short fibres normal to the wood. Yield was over 40% air-dry fibre. Supply, harvest, transport, preparation and pulping methods are described and discussed. Experimental pulping of orchard waste and slash by a soda process produced good-quality cigarette paper. [Cf. *For. Abstr.* 14 (p. 123).]

839. FARBER, E. (to Hardwood By-Products, Inc.). **Alkaline sulfite digestion of hardwood.** *U.S. Patent* No. 2,528,349, Oct. 31, 1950. pp. 4. P.O.

A process for extracting hemicelluloses, lignins, pentosans, and similar bonding agents from hardwood to produce a pulp, consisting essentially in subjecting hardwood particles at atmospheric pressure and a temperature of ca. 40° C. to the action of an aqueous solution consisting of ca. 0·5% by weight of both NaOH and Na_2SO_3.

840. FARBER, E. (to Hardwood By-Products, Inc.). **Two-step digestion of hardwoods.** *U.S. Patent* No. 2,528,350, Oct. 31, 1950. pp. 4. P.O.

Process of preparing for fiberizing treatment, particles of hardwood having a hemicellulose content of not less than 18%. They are digested for 1–2 hours at 15–30° C. with a dilute aqueous solution (0·4–2·5% Na_2SO_3), and then for 1–2 hours at 70–80° with an aqueous solution (1–4% NaOH) at atmospheric pressure.

Fibreboards

See also Nos. 588–9, 592, 595, 831.

841. FICKLER, H.-H. Der Stand der Entwicklung von Prüfungsrichtlinien für die Eigenschaften von Holzfaserplatten. **[The development of criteria for**

the testing of properties of fibreboards.] *Holz Roh- u. Werkstoff* 10 (5), 1952 (207–19). 13 refs. [G.] P.R.

An account of test methods developed in various countries and their gradual coalescence to international standards under the auspices of FAO.

842. HUNTER, R. S. **Light reflection measurements applicable to the surfaces of wallboard.** *Tappi* 35 (7), 1952 (325–31). 11 refs. P.R.

Illustrated description of several measuring instruments and methods of measurement.

843. KLAUDITZ, W., and OHSE, G. Gesichtspunkte zur Typisierung, Prüfung und Verwendung von Holzspanplatten. **[Classification, testing, and uses of chipboards.]** *Repr.* from *Tagungsbericht des Vereins für technische Holzfragen, Braunschweig, 1951*, 1951 (147–58 + 3 photos, 1 dgm., 4 gphs.). 2 refs. [G.g.] P.R.

The following 4 types of chipboard are suggested as a basis for classification: (1) Chipboards (*Spanholz-Platten*): very homogeneous, made from wood chips, mostly thin lamellar chips, and having a relatively continuous surface; it is suggested that these boards could have a density of 0·4–1·3 g./c.c., the bending strength would vary between 150 and 1100 kg./sq. cm., and the minimum thickness would be 2, or even 1, mm. (2) Chipboards (core) (*Holzspan-Mittellageplatten*): surface not smooth; density 0·3–0·5 g./c.c.; bending strength 40–100 kg./sq. cm., thickness 12–14 mm.). (3) Chipboards (layer) (*Holzspan-Schichtplatten*): used as cores for plywood-like structures, with face layers of veneer or of (1); density 0·5–0·7 g./c.c.; bending strength 150–300 kg./sq. cm. (4) Chipboards (compound) (*Holzspan-Verbundplatten*): consisting of (2) with face veneers; density 0·5–0·7 g./c.c.; bending strength 200–400 kg./sq. cm. Methods of testing are briefly described, and possible uses of chipboards are discussed.

844. KLAUDITZ, W., and GITTEL, W. Eignung, Bewertung und Verarbeitung von Kunstharzbindemitteln bei der Herstellung von Holzspanplatten. **[Suitability, evaluation, and application of synthetic-resin binders in the manufacture of chipboards.]** *Repr.* from *Tagungsbericht des Vereins für technische Holzfragen, Braunschweig, 1951*, 1951 (135–45 + 4 photos + 1 dgm. + 1 gph.). [G.g.] P.R.

Owing to costs, only hardenable synthetic-resin binders (phenol and urea types) can be used at present in chipboard manufacture. Hardeners, extenders, and the application of binders, are briefly discussed. A method has been developed for comparative tests of the suitability of these binders. Chips of constant properties are converted into boards, using 8% of binder, and the test boards are tested for wet and dry strength, and for moisture, water absorption and swelling. The results of some tests are presented in the form of tables and graphs.

845. KLAUDITZ, W. Gesichtspunkte der Forschung zur Verfahrenstechnik der Holzspanplattenherstellung. **[Perspectives in the investigation of technical methods of chipboard manufacture.]** *Repr.* from *Tagungsbericht des Vereins für technische Holzfragen, Braunschweig, 1951*, 1951 (121–34 + 3 photos, 2 dgms.). 3 refs. [G.g.] P.R.

A general account dealing with basic technical and economic considerations, manufacturing methods and size of plants, chipping of wood, seasoning of chips, addition of binders and moulding and pressing of boards.

846. KLAUDITZ, W., and STOLLEY, I. Holzschutz bei Holzspanplatten. **[Wood preservation in chipboards.]** *Repr.* from *Tagungsbericht des Vereins für technische Holzfragen, Braunschweig, 1951*, 1951 (159–66 + 2 photos). 3 refs. [G.g.] P.R.

Describes experiments still in progress which seem to indicate the possibility of manufacturing fungus-resistant, and probably also insect-resistant, chipboards, using simple working processes.

847. KLAUDITZ, W. Ergebnisse und Stand der Forschung und Technik auf dem Gebiet der vermehrten Nutzung von geringwertigem Wald- und Industrie-Holz zur Herstellung von Holzfaser- und Holzspanplatten. **[Results and present position of research and practice in the increased utilization of low-grade and waste wood in the manufacture of fibreboards and chipboards.]** *Repr.* from *Tagungsbericht des Vereins für technische Holzfragen, Braunschweig, 1951*, 1951 (67–102 + 13 photos, 1 dgm., 4 gphs.). 22 refs. [G.g.] P.R.

Industrial and research achievements of German research laboratories and industrial plants are discussed, and various properties of fibreboards and chipboards are tabulated. A map of West Germany shows the location of the industrial plants involved.

848. KING, F. W., and BENDER, F. **Production of hard-pressed fibreboard from Western Red Cedar mill waste.** *Pulp Paper Mag. Can.* 53 (6), 1952 (137–41).

Hard-pressed fibreboards were made from the different components (wood, bark, shingle-hay and sawdust) of Western Red Cedar shingle-mill waste, separately and combined (after separate pulping) in different proportions. Boards were also made from these pulps with a binder consisting of a pulp from the shingle-hay fraction chemically treated and further refined in a beater, of hydrated waste newsprint or of carboxymethylcellulose. Boards from the wood component meet the high strength requirements of the Federal specification for 'Class A' hardboard. Boards meeting the British standard for 'hardboard type' fibreboards can be made from (1) the bark component alone, (2) the wood and bark fractions or (3) the wood, bark and shingle-hay fractions. Boards from the shingle-hay and sawdust fraction alone do not meet the Federal specification or the British standard but could replace hardboards in panelling or furniture manufacture, where high strength is not usually needed. The addition of a binder increased strength properties. [Cf. *For. Abstr.* 12 (No. 3190).]

849. BAKER, M. W., BEIL, F. F., CURTIS, C. F. II, and PATTON, E. A. (to Curtis Companies Incorporated). **Improvements in or relating to a method of preparing cellulosic board material and the**

product resulting therefrom. *Brit. Patent* No. 670,985, April 30, 1952. pp. 11 + 10 dgms. P.R.

A mixture of granulated cellulosic material (disintegrated wood) and a binder (thermo-setting resin), having a moisture content of 5–25%, is subjected to heat (at least 280° F.) and a pressure of 150–500 lb./sq. in. to form a board while maintaining its moisture content, the pressure being then slowly released.

850. SERRUYS, J. E. E. **Improved plant for the manufacture of wood fibre slabs [with a hydraulic binder].** *Brit. Patent* No. 665,312, Jan. 23, 1952. pp. 3 + 7 dgms. P.O.

851. ELMENDORF, A. **New fiber boards made with non-critical binders.** *Proc. U.S. For. Prod. Res. Soc.* 5, 1951 (155–61). 8 refs.

In view of possible shortages of synthetic resins, a survey is made of types of fibreboard made in the U.S.A. and elsewhere with other binders likely to remain available. Boards made from shavings plus an inorganic binder (cement etc.) merit serious consideration and further development.

863. *Wood Hydrolysis. Saccharification*

852. ANT-WUORINEN, O. V. A. Menettelytapa puun t.m.s. hiilihydraattiosan hydrolysoimiseksi. **[Hydrolysis of carbohydrates from wood.]** *Finnish Patent* No. 24,914, Oct. 12, 1951. pp. 4 + 2 dgms. [Fi.fi.sw.] P.O.

Wood carbohydrates are hydrolysed in several stages under increased pressure, using an aqueous solution of SO_2 at temperatures above 100° C., the wood being passed in countercurrent to SO_2. In at least 2 stages the temperature ought to be above 170°, and in at least 2 following stages, below 170°, the sugar solutions obtained in these two temperature ranges being then processed separately.

853. ROSEN, E. La composition du bois et les rendements de l'hydrolyse. **[The composition of wood and yields from hydrolysis.]** *Chim. et Industr.* 67 (3), 1952 (415–22). 2 refs. [F.] D.S.I.R.

A general review of modern research on wood hydrolysis is followed by an account of results obtained in industrial hydrolysis at the pilot plant of the Société du Glucol, Sorgues, France. Yields of reducing sugars, fermentability of sugars, fermentable hexose, lignincellulosic residue, furfural, ethanol, and 'methylene' (methanol plus acetone), are tabulated for each of the 3 stages of hydrolysis by Meunier's method, for Pine and Poplar sawdusts. Results of industrial single-stage hydrolysis and fermentation of Pine, Fir, Poplar, Beech, and Chestnut, are also tabulated.

854. KRACH, H. Wykorzystanie odpadów drzewnych na drodze hydrolizy oraz przeróbhydrolizatu na drożdże. **[Utilization of wood waste by means of hydrolysis and growing yeast on the hydrolysate.]** *Prace Inst. Bad. Leśn.* No. 76, 1951. pp. 31. 26 refs. [Pol.russ.e.]

Pine sawdust was hydrolysed with concentrated H_2SO_4 (or HCl). After 6 hours of H_2SO_4 treatment, the reducing-sugar yield was 33·75% and that of total sugars 40·27%. The subsequent treatment included: purification of the hydrolysate, analysis of the purified hydrolysate and of the precipitate, acclimatization of the yeast culture, preparation of inoculum, fermentation, and analysis of the yeast obtained. It was found that: (1) the yield of yeast based on the total sugar content decreases as the sugar concentration of the medium increases; (2) the optimum sugar concentration is 0·5–1·5%; (3) reducing the duration of the fermentation process from 24 to 8 hours has no adverse effect on the yield; (4) the optimum pH value is ca. 6; (5) certain substances [not named in the paper] stimulate the growth of the yeast cell.

866. *Utilization of Wood Extractives*

855. **[Tests of W. Bengal tanstuffs.]** *Rep. For. Res. W. Bengal 1948/49*, 1951 (12–4).

Bark of *Cassia fistula* mixed with myrobalans is suitable for tanning light leathers. Extract from *Acacia catechu* wood gives too dark a colour to be commercially desirable.

856. SETTIMJ, M. Utilizzazione industriale di cascami di castagno dell'industria del tannino, mediante distillazione secca. **[Industrial utilization of Chestnut wood chips from the tannin industry by dry distillation.]** *Annali di Chimica Applicata, Roma* 39 (6/7), 1949 (397–406). 15 refs. [It.it.] L.S.

Laboratory and pilot-scale experiments demonstrated the possibility of distillation on a commercial scale of wood chips after extraction of tannin. The principal products are charcoal, furfural and acetic acid. A possible plant for this purpose is described.

867. *Destructive Distillation*

See also Nos. 593, 758, 856.

857. LOWSON, D. S. **Kulit arang.** *Malay. Forester* 15 (3), 1952 (139–40).

Describes the use of the sweepings of Mangrove charcoal kilns in the manufacture of lime from sea shells.

858. **[Metal charcoal kilns.]** *Journal of the Forestry Institute, Teheran* 2 (6; 7), 1951 (4, 9–11; 4, 9). [Per.]

An appeal for the use of metal kilns in place of the current wasteful country methods. Fifteen types of kiln are listed and specifications given for the Magnein (illustrated) which the Forestry Institute has selected for general use in Persia.

859. CHARLES, E. La distillation moderne du bois. **[Modern wood distillation.]** *Chim. et Industr.* 67 (1), 1952 (56–62). 13 refs. [F.] D.S.I.R.

Describes different methods (predominantly French or used in France) applied before and after the war for the carbonization of wood with or without recovery of distillates. A detailed description is given of retorts with external and internal heating, and of the self-heating Stafford retort. The advantages and disadvantages of modern horizontal and vertical retorts are discussed. Various methods of treating the pyroligneous liquid are described.

860. MENE, P. S., and WARHADPANDE, U. R. **Dephlegmation of wood distillation vapours.** *J. sci. industr. Res., India* 11*B* (1), 1952 (33–5). 11 refs. D.S.I.R.

Describes an experiment in which wood chips from *Nyctanthes arbortristis* were distilled. Using a reflux dephlegmator and a dephlegmation temperature of 90–100° C., a tarry condensate containing only 0·5% of 'soluble' tar was obtained. The temperature of the retort has a decisive effect on the process of dephlegmation: at temperatures over 300° C., all the tar passes over uncondensed from the dephlegmator.

861. Terzibašjjan, G. G., and Leĭbzon, Z. I. Ispytanie novyh obrazcov gazogeneratornyh avtomobileĭ dlja drevesnogo topliva. **[Testing of new models of motor cars equipped with wood-fuel gas producers.]** *Avtomobiljnaja i Traktornaja Promyšlennostj, Moskva* 1951 (3), (27–30). [Russ.] D.S.I.R.

Presents results of tests made in 1949–50 on 19 lorries of 5 types fitted with various wood-fed gas producers. Birch blocks with moisture content ranging from 24 to 80% were used as fuel for the lorries transporting firewood and pulpwood over a distance of 25 km. For a 1000-km. run, Pine blocks (m.c. 23%) and Pine firewood (m.c. 75%) were used. The average fuel consumption was: (1) for green Birch blocks or moist Birch firewood, 273 kg./100 km., i.e. on a dry-wood basis, 40% more than with dry fuel; (2) for Birch blocks (51% m.c.), 142 kg./100 km. The maximum speed was 53–59 km./hour, the starting speed 35–40 km./hour, and the speed on a 1/20 slope, 15–18 km./hour. Starting from cold required 5·5–9 min. (13 min. for one of the engines); starting of a hot engine, 3 min. The average wear of cylinders was 0·108 mm./10,000 km. for two lorry types.

89. OTHER ('MINOR') FOREST PRODUCTS

892. *Vegetable Products*

See also No. 100.

892.4. Bark Products. Tanstuffs. Cork

See also Nos. 356, 529, 855, 880.

862. Grochowski, W., and Sułkowski, M. W sprawie pozyskiwania kory świerkowej w zimie. **[Winter harvesting of Spruce bark.]** *Prace Inst. Bad. Leśn.* No. 77, 1951 (25–46 + 1 tbl.). 6 refs. [Pol. russ.]

In field and laboratory studies made in 1948–50 the following factors or properties were determined for both winter and summer harvests of Spruce bark in the same forests: yield of material, efficiency of labour, moisture content, content of tannins and non-tannins, and the characteristics of the bark-drying process. Although the tannin content in winter is not less than in summer, the method of winter harvesting used in 1948–50 is uneconomical: the work of stripping is very burdensome, while the bark yield is somewhat less than in summer; a considerable part of cambium remains with the stem, and, finally, the drying of the bark in winter presents more difficulties than in summer.

863. Martin, P. **Tannin bearing species of N.S.W.** *Tech. Notes For. Comm.* (*Div. Wood Technol.*) *N.S.W.* 5 (3), 1951 (8–11).

Quotes figures for Australian production and consumption of tannins, discusses the use of tannins in leather manufacture, building boards and moulding powders, and adhesives, and estimates the tannic content of the Australian tannin-bearing *Acacia*, *Eucalyptus*, *Callitris* and *Pinus* spp.

864. Chambard, P., Jullien, I., and Lasserre, R. Le tanin de l'écorce d'*Eucalyptus sideroxylon* (3e partie). **[The tannin of *E. sideroxylon* bark (Part 3).]** *Bulletin de l'Association Française des Chimistes des Industries du Cuir, Paris* 13 (9), 1951 (162–74). 1 ref. [F.] L.S.

[Cf. *For. Abstr.* 12 (No. 1468).] Presents the results of laboratory tests on the use of *E. sideroxylon* bark extract with the synthetic tanstuff Albatan (a sulphonic derivative of phenol). The bark extract alone is not a good tanning agent; if, however, it is used in mixture with the synthetic tanstuff and, ultimately, bleached, the results are good. The optimum proportion of the synthetic tanstuff is ca. 20%.

892.5. Medicinal Plants, Edible Plants, Insecticides from Plants, etc.

See also Nos. 99–100.

865. Koechlin, J. Sur quelques usages de plantes spontanées de la région de Brazzaville. **[Some uses [in native medicine] of plants occurring naturally in the Brazzaville region.]** *Bulletin, Institut d'Études Centrafricaines, Brazzaville* (*n.s.*) No. 2, 1951 (103–9). 5 refs. [F.]

866. Chatterjee, A., and Majumdar, S. G. **Alkaloids from *Glycosmis pentaphylla* Correa.** *Sci. & Cult.* 17 (7), 1952 (306–7). 10 refs. E.M.B.

867. Chatterjee, A., and Bose, S. **A new alkaloid from the root of *Rauwolfia serpentina* Benth.** *Sci. & Cult.* 17 (3), 1951 (139). 15 refs. E.M.B.

868. Chatterjee, R. S., and Maitra, S. R. **A note on physiological and clinical findings of the active principle (spirochin) [isolated from the root] of the *Moringa pterygosperma*.** *Sci. & Cult.* 17 (1), 1951 (43–4). E.M.B.

869. Hattori, S., and Matsuda, H. **Rhoifolin, a new flavone glycoside isolated from the leaves of *Rhus succedanea*.** *Arch. Biochem.* 37 (1), 1952 (85–9). 7 refs. O.R.S.

870. Narasimhachari, N., and Seshadri, T. R. **Components of the bark of *Prunus puddum*. Part II. Padmakastin and padmakastein.** *Proc. Indian Acad. Sci.* 35*A* (4), 1952 (202–9). 7 refs. [Delhi University.] O.R.S.

Padmakastin, a glycoside, and padmakastein, the corresponding aglucone, have been isolated from the bark. Padmakastein has been identified as dihydroprunetin. [Cf. *For. Abstr.* 12 (No. 1472).]

871. Kenknight, G. **Germination inhibiter in wood and bark of Peach and wild *Prunus* [*P. angustifolia* and *P. serotina*].** *Abstr.* in *Phytopathology* 42 (5), 1952 (285).

872. Rastogi, R. P., Sharma, V. N., and Dhar, M. L. **Chemical examination of [the bark of] *Ailanthus malabarica* DC.** *J. sci. industr. Res.*,

India 11*B* (3), 1952 (124–5). 3 refs. [Central Drug Research Institute, Lucknow.] D.S.I.R.

Malanthin, a non-glucosidal bitter, was obtained in a yield of 0·1% on the weight of the dry bark.

892.6. Resin and Turpentine. Essential Oils. Fixed Oils and Fats. Gums. Latex. Dyestuffs. Sap Sugar

See also Nos. 90, 357–60, 689.

873. Radosavljević, S. D., and Despić, A. R. Ispitivanje domaćeg terpentinskog ulja dobivenog destilacijom balsama crnog bora (*Pinus nigra*). **[Analysis of Jugoslav turpentine oil obtained from *P. nigra*.]** *Glasnik Hemiskog Društva, Beograd* 16 (1), 1951 (35–48 + 1 tbl.). 10 refs. [Serb.serb.f.] L.S.

Analysis of the oleoresin of *Pinus nigra* from various sites shows that chemical stimulants have no effect on the chemical composition of the oleoresin or on the quality of its products—rosin and turpentine oil. The composition of turpentine oil obtained by distillation of oleoresin from the Mokra Gora region is 94·7% α-*l*-pinene, 2·0% β-*l*-pinene, 1·55% *l*-limonene with dipentene (*dl*-limonene), 0·92% isopinene.

874. Mills, J. S., and Werner, A. E. A. **Paper chromatography of natural resins.** *Nature, Lond.* 169 (4312), 1952 (1064).

Each of the resins so far tested, namely, dammar, mastic, sandarac, rosin, elemi, and copal, gave a characteristic chromatogram which may be distinguished by the number, colour, and R_F values of the coloured zones.

875. Puntambekar, S. V. **Chemical examination of the fatty oil from the seeds of *Mallotus philippinensis* Muel.-Arg.** *J. Indian Acad. Sci.* 35*A* (2), 1952 (57–68). 40 refs. [Forest Research Institute and Colleges, Dehra Dun.] O.R.S.

876. **[Seed oil from *Licania* spp.]** *Rep. For. Dep. Brit. Guiana 1950*, 1951 (9).

Tests were made on seeds of *Licania venosa* and *L. mollis* for a possible substitute for Oiticica (*L. rigida*) oil. Oil yield was 21·24% and upwards compared with 55–62% for Oiticica.

877. McIlroy, R. J. **West African plant gums. Part I. *Khaya grandifoliola* and *Anogeissus schimperi*.** *J. chem. Soc., Lond.* May, 1952 (1918–9). [University College, Ibadan, Nigeria.] O.R.S.

Hydrolysis of gum of *K. grandifoliola* yields galactose and a degraded polysaccharide containing galactose, rhamnose and galacturonic acid, while hydrolysis of gum of *A. schimperi* yields arabinose, galactose and a degraded polysaccharide containing arabinose, galactose and glucuronic acid.

878. Guseva, A. R. O himičeskom sostave listjev èvkommii (*Eucommia ulmoides* Oliv.). **[The chemical composition of leaves of *E. ulmoides*.]** *Dokl. Akad. Nauk SSSR* 82 (5), 1952 (757–60). 15 refs. [Russ.] A.P.B.

Analyses of leaves collected in October–November 1949 and 1950 showed the following composition in % based on dry weight: gutta-percha 1–3, 'resin' 4·3–6·5, monosaccharose 5·6, 'saccharose' 8·1, polysaccharides 2·5 [quoted elsewhere in the paper as 8·5], glucoside (calculated as aucubin) 11·5, hemicellulose 5·3, cellulose 8·3, pentosans 6, tannins 1·4–1·6, organic acids (malic, tartaric, fumaric) 4·1, total hot-water solubles 51–53, phytosterols (present), total P 0·21–0·3, total N 0·81–1·0, ash 14·5–15·5 (of which 55–60% is SiO_2 and 20–21% CaO).

The gutta-percha content varied in different individuals and also with exposure (lower in shade leaves) and age (higher in older trees). The 'resin' (accompanying the gutta-percha in the chloroform extract and separated by re-extraction with acetone or hot alcohol) contained colouring matter, lipoids and other substances. On saponification 50% was unsaponifiable, and from this, crystalline phytosterols of m.p. 131° C. were obtained via the alcoholic solution. A further substance was obtained, soluble in hot alcohol or hot acetone and separating on cooling as a white precipitate which after recrystallization from alcohol had a m.p. of 74–76°, yielding a bromide with 59·2% Br content, and having an elementary composition corresponding to ($C_{13}H_{26}O$).

892.7. Fruits, Seeds. Fibres, Yarns and Flosses

See also Nos. 314, 422, 875–6, 880.

879. Studia z dziedziny ubocznego użytkowania lasu. **[Studies on minor forest products.]** *Prace Inst. Bad. Leśn.* No. 77, 1951. pp. 47 + 2 tbls. 10 refs. [Pol.russ.e.]

Contains the following papers: Investigations on the quality of *Vaccinium myrtillus* berries (*A. Bromberg* and *S. Mrozewski*); Studies on the storage of *Oxycoccus quadripetalus* berries (*S. Mrozewski* and *W. Grochowski*); Winter harvesting of Spruce bark (*W. Grochowski* and *M. Sułkowski*). [See *For. Abstr.* 14 (No. 862).]

9. FORESTS AND FORESTRY FROM THE NATIONAL POINT OF VIEW. SOCIAL ECONOMICS OF FORESTRY

90. GENERAL

880. **European Commission for Forests and Forest Products of FAO: 3rd meeting of the Subcommission for the Mediterranean Countries: Contributions of the Professors and Docents in the Faculty of Forestry at the University of Istanbul.** *Publications of the Faculty of Forestry, University of Istanbul* No. 21, 1952. pp. 42 + 1 tbl. + 2 maps. [E.] X.

Includes the following papers: Forests and agriculture in Turkey with special reference to the necessity of water economy under semi-arid conditions (*F. Heske*); A summary of research on forest soils in Turkey (*A. Irmak*); Importance and methods of afforestation in Turkey (*F. Saatçioglu*); Necessity to improve pastures to reach efficient forest protection (*G. Acatay*); [Some data on wood production of plantations of *Eucalyptus rostrata* in the Mediterranean region of Anatolia] (*F. Firat*; in French); Technical and economic properties of some important Turkish timber species (*A. Berkel*); The importance of Cork Oak (*Quercus suber*) for Turkey (*H. Kayacık*); Distribution of the Valonea Oak (*Quercus aegilops*) in Turkey and its ecological basis (*S. Inal*).

902. *History of Forests and Forestry*

See also Nos. 577–8.

881. ANDERSON, M. L. **Early hardwood planting in Scotland and its present-day significance.** *Scot. For.* 6 (3), 1952 (67–76).

882. STEVEN, H. M. **The progress of technical forestry in Britain 1926–51.** *Forestry* 25 (2), 1952 (85–91).

883. FOX, L., and RUSSELL, P. **Leicester Forest.** Leicestershire Archaeological Society and Edgar Backus, Leicester. 1948. pp. 144 + 12 photos + 1 map.

History of the forest.

884. DANNFELT, M. J. Svensk skogsvård under ett halvsekel. **[Swedish forestry during the last 50 years.]** *Svenska SkogsvFören. Tidskr.* 50 (2), 1952 (118–36). [Sw.]

Discusses briefly the different silvicultural systems used, the increased use of mechanical soil scarifiers, thinning and pruning, tree-breeding, grazing, draining, and forest roads, and gives figures for timber production.

903. *Forest Policy, General*

885. **Principles of forest policy.** *Report of the 6th Session of the Conference of FAO, 19 November–6 December 1951*, 1952 (64–7). [E.F.Span.]

The Sixth Session of the FAO Conference, held in November and December 1951, was marked by the unanimous passing of a resolution on principles of forest policy, which were recommended to the attention of all member governments. The resolution deals only with general principles. (1) Each country should determine and set aside areas to be dedicated to forests, whether at present forested or no. (2) Each country should apply the best practicable techniques in seeking to derive in perpetuity, for the greatest number of its people, the maximum benefits available from the protective, productive and accessory values of its forests. This implies that: (*a*) protection should be afforded against damage or destruction by man or by such causes as fire, insects, and tree diseases; (*b*) production should be organized with a view to obtaining sustained yield as soon as possible, priority being given always to the protective rôle of the forest; (*c*) economic and rational methods of exploitation, conversion, and utilization of forest products should be encouraged. (3) Adequate knowledge of all aspects of forest resources, forestry, and the consumption and utilization of forest products, is indispensable. To this end research should be organized and expanded, and the application of the results obtained should be consistently encouraged. (4) Public consciousness of forest values should be developed by all means possible.

For the implementation of such a forest policy the following principles are laid down: the enactment of a forest law, the establishment of a forest service and an effective organization to deal with research, and the provision of adequate training for all concerned with the management of forests or the utilization or processing of forest products.

886. **National forest policy.** Ministry of Food and Agriculture, New Delhi, India. 1952. pp. 8.

A new national forest policy for India, the principles of which are recommended to the State governments in framing their separate policies.

887. GULICK, L. H. **American forest policy: a study of government administration and economic control.** Duell, Sloan and Pearce, New York, for the Institute of Public Administration. 1951. pp. 252. Price $3·50 (28*s.*).

888. **Forestry and timber matters in W.A.** *Aust. Timb. J.* 18 (3), 1952 (203 . . . 229).

Summarizes the results of an inquiry and makes recommendations on forest resources, forest regulation and administration, forest policy, utilization, sawmilling, valuation and finance, administration, legislation and industrial demand.

904. *General Regional Accounts of Forests and Forestry*

889. JÄRVINEN, A. E. Perä-Pohjolan metsien tulevaisuus. **[The future of the forests in N. Finland.]** *Metsät. Aikak.* 1951 (6), (177–80). [Fi.]

Gives a detailed account of the present state of the forests, and discusses problems of ensuring natural regeneration, of improving existing stands and of logging economically inferior and inaccessible stands. [Cf. *For. Abstr.* 13 (No. 1994).]

890. [SHAIBĀNI, M.] **[A forest survey of the 5th Ustān [Province].]** *Journal of the Forestry Institute, Teheran* 2 (1–7), 1950–51 (5–6; 4; 4; 6–7; 6 . . . 12; 5, 8; 8). [Per.]

The substance of a report, for which M. Shaibānī was commissioned by the Forestry Institute, on these forests situated in Gilān, in the north-west. In the absence of written records, no clear ownership can be established and even where tribal possession seems clear, the individual is left to exploit what he can. Under such conditions, greatly aggravated by the war, the forest is fast disappearing, the chief drain being the charcoal trade, but also fuel, grazing and clearing for agriculture. Fire danger is small, owing to the paucity of undergrowth and litter. Government revenue, from royalties on fuel and charcoal, is lowered at least 50% by systematic evasion. [Cf. *For. Abstr.* 14 (No. 577).]

891. Swain, E. H. F. **Forestry possibilities in Ethiopia.** *Unasylva* 6 (1), 1952 (15–20).
Includes climatic data.

892. Guillaumin. L'agriculture en Nouvelle-Calédonie. **[Agriculture in New Caledonia.]** *C.R. Acad. Agric. France* 37 (13), 1951 (585–93). [F.] A.P.B.
Contains a brief note on the forests of New Caledonia, and suggests that the following species might be more intensively exploited: *Hernandia cordigera*, *Semecarpus atra*, *Geissois* sp., *Elaeocarpus ovigerus*, *Albizzia granulosa*, *Serianthes calycina*, *Neoguillauminia cleopatra*, *Flindersia fournieri*, *Lasianthera austro-caledonica* and *Ilex pancheri*.

905. *Forest Statistics and Resources*

893. Mariani, G. Aumento e diminuzione delle superfici boscate in Italia. **[The augmentation and diminution of wooded areas in Italy [between 1937 and 1951].]** *Ital. for. mont.* 7 (3), 1952 (151–4). [It.]

894. Oversigt over de danske Statsskoves udbytte av ved og penge for finansåret 1950–51. **[Review of the timber and financial yields of the Danish State Forests for the financial year 1950–51.]** Nielsen & Lydiche (M. Simmelkiær), Copenhagen. 1952. pp. 17 + 1 tbl. [Dan.]

895. **[Swiss forest statistics for 1949.]** *Schweiz. Forststatist.* 12 (5), [1952]. pp. 56. [G.F.]

896. **Some useful statistics for the forest officer in India.** *Indian For.* 78 (6), 1952 (320–6).
Statistics of land use, forest area, out-turn and consumption of wood, forest ownership etc.

907. *Indirect Significance of Forests (Rural Amenity, National Parks, Forest Influences etc.)*

See also Nos. 9–14, 34–9, 347.

897. Čolić, D. B. Značaj i potreba izdvajanja šumskih rezervata. **[Significance and need for the isolation of forest reserves.]** *Šum. List* 76 (5/6), 1952 (147–52). 7 refs. [Serb.]
The republic of Serbia has 19 reserves totalling 4120 ha. on which no felling is allowed at all: a further 10,000 ha. of 'semi-reserves' in which only sanitary fellings may be made, and ca. 37,250 ha. of national parks.

91. LAND USE, LAND-USE POLICY (INCLUDING AFFORESTATION POLICY)

See also Nos. 345, 880, 892, 908–9.

898. **Statistics for colonial agriculture: report on the organization of recording and estimating.** *Colonial Research Publications* No. 11, 1952. pp. 84. H.M. Stationery Office, London. Price 7*s.* 6*d.*

899. Wadsworth, F. H. **Forest management in the Luquillo Mountains. II. Planning for multiple land use.** *Carib. For.* 13 (2), 1952 (49–74). 5 refs. [E.Span.]
[Cf. *For. Abstr.* 13 (No. 3250).] Discusses the factors to be considered in such planning, viz. reservation of climax areas for ecological studies, wildlife protection, watershed management, recreational amenities, farming, mining, and timber production, and presents a scheme for the amount of land to be set aside for such purposes.

92. FOREST OWNERSHIP AND OWNERSHIP POLICY

900. James, L. M., Hoffman, W. P., and Payne, M. A. **Private forest landownership and management in Central Mississippi.** *Tech. Bull. Miss. agric. Exp. Sta.* No. 33, 1951. pp. 38.

93. PUBLIC SUPERVISION AND REGULATION OF FORESTRY, INCLUDING LEGISLATION FOR THESE PURPOSES

See also Nos. 4, 908–9.

901. Trifone, R. Il vincolo prima e dopo la legge del 1877. **[The forest code before and after the law of 1877.]** *Ital. for. mont.* 7 (3), 1952 (120–7). [It.f.]

902. Recopilación de disposiciones vigentes sobre explotaciones forestales, aserrío y mercado de la madera. **[A collection of the regulations in force, governing exploitation of the forests, sawmilling and the timber trade. [Vols. I-II].]** Grupo Nacional de Rematantes y Aserradores, Sindicato Nacional de la Madera y Corcho. 1950–51. pp. 230 + 145. [Span.]

903. **The forest manual: containing the Forest Act (Burma Act IV, 1906) as amended . . . 1906 . . . 1912 . . . 1920 . . . 1926 . . . 1937 . . . 1938 . . . 1940 and 1941, and the rules, notifications and orders thereunder.** Superintendent, Government Printing and Stationery, Rangoon. 1948. pp. 325 + 6 lists of corrigenda. [E.] Price *Rs.*7.12.
A revision, dated 1944, of the 1930 edition.

904. Legislación forestal de Perú. Recopilación de leyes, decretos y resoluciones. **[Forest law of Peru. Compilation of laws, decrees and resolutions.]** Inspección General Forestal, Ministerio de Agricultura, Lima. 1952. pp. 109 + iii. [Span.]

905. Augier, P. W. **Private forests and private forest legislation.** *Indian For.* 78 (8), 1952 (400–8).
Explains and discusses the Bihar Private Forests Acts of 1946 and 1947, their application, and the lessons to be learnt for other similar state action to prevent uncontrolled exploitation and destruction of forests in India.

906. UMBARJE, S. R. ***Gurcharan* or woodland protected forests in Thana (Bombay State).** *Indian For.* 78 (6), 1952 (315–9).

Deals with protected forests under the dual control of the Revenue Department and the Forest Department, which are laden with numerous rights and privileges. A short history of past management is given, causes for deterioration are discussed and remedies suggested.

907. SANGSTER, R. G. **The forest dedication scheme in Buganda Province.** Government Printer, Uganda. 1951. pp. 5. (6th British Commonwealth Forestry Conference, Canada, 1952.)

A short account is given of the geography and history of Buganda as a background to the evolution of a dedication scheme for the preservation and better management of forests on private land belonging to Africans. The broad lines of the scheme are then described. [Cf. *For. Abstr.* 14 (No. 568).] *Author's summary.*

94. OTHER METHODS TO IMPLEMENT FOREST POLICY

908. VAISSIÈRE, J. DE. Les perspectives d'avenir du fonds forestier national. **[Future prospects of the National Forest Fund.]** *Bull. Soc. for. Franche-Comté* 26 (6), 1952 (307–22). [F.]

Reviews the achievements of the Fonds Forestier National in promoting afforestation, the difficulties encountered, and probable future developments. [Cf. *For. Abstr.* 10 (No. 2373).]

909. Numéro spécial sur le Fonds Forestier National. **[Special number on the [French] National Forest Fund.]** *Rev. for. franç.* 1952 (9), (525–602). [F.]

Contains articles describing several afforestation and fire-protection schemes, and planting methods, sponsored by the Fonds Forestier National.

941. *State Subsidies etc.*

See No. 312.

944. *Co-operation. Collaboration of Forest Owners*

910. SEVNIK, F. Zadružništvo v gozdnem in lesnem gospodarstvu Slovenije. **[Co-operative movement in the forest and timber economy of Slovenia.]** *Gozd. Vestn.* 10 (5/6), 1952 (141–54). 16 refs. [Sloven.]

History of the development of forest co-operatives and of wood-processing co-operative societies in Slovenia since 1848, and their present position.

945.1. *Advisory and Information Services. Documentation Centres*

911. FORD ROBERTSON, F. C. **The work of the Commonwealth Forestry Bureau Oxford 1947–1951. A progress report.** Forestry Commission, London. 1952. pp. 8. (6th British Commonwealth Forestry Conference, Canada, 1952.)

945.3. *Education. Training*

See also No. 810.

912. **The Cyprus Forestry College.** *For. Treasures* 8 (1), 1952 (16–24).

Account of the new college and its inauguration. [Cf. *For. Abstr.* 13 (p. 239).]

945.4. *Research*

See also Nos. 81–2, 596, 735, 880.

913. **Gazetteer of agricultural and forestry research stations in the British Commonwealth, 1952, including a list of such stations in the Republic of Ireland.** Commonwealth Agricultural Bureaux, Farnham Royal, Bucks. 1952. pp. xix + 517. Price 30*s.*

Arranged geographically, with alphabetical indexes of research stations and subjects of research.

914. MATUSZ, S. Działalność Zakładu Mechanizacji Produkcji Leśnej. **[The activity of the Section for Mechanization in Forestry [, Polish Forest Research Institute].]** *Sylwan* 96 (2), 1952 (210–8). [Pol.]

Includes illustrated descriptions of: (1) forest cultivator for loosening soil for depths down to 40 cm., (2) medium-heavy forest plough, (3) combined plough and seed driller (light and medium), (4) combined cultivator (working depth 25 cm.) and seed driller, (5) caliper, (6) tree volume slide-rule, (7) circular slide-rule for evaluating the volume of trees and stands, (8) circular slide-rule for volume of round timber, (9) 'universal valuer's dendrometer', (10) apparatus for recording the projection of the tree crowns, (11) prototype apparatus for the determination of the transmission of light by crowns and canopies, (12) a simple rotary guide to the grading of timber.

915. SUČIĆ, J. Institut za naučna šumarska istraživanja narodne republike B i H. Godina 1949–1951. **[The Forest Research Institute of the republic of Bosnia and Herzegovina, 1949–51.]** *Godišnj. Inst. nauč. šumar. Istraž., Sarajevo* No. 1, 1951 (3–35). [Croat.e.f.g.]

An account of its history and work.

916. SAATÇIOĞLU, F. Bahçeköy örnek devlet orman işletmesinde kurulmuş olan Orman Ağacı Tohumları Kontrol Istasyonu ve çalışma esasları. **[The Forest Tree Seed Control Station, newly set up at the model departmental forest at Bahçeköy and the basis of its working.]** *Repr.* from *Istanbul Üniv. Orm. Fak. Derg.* 1*B* (2), 1951 (21–43). [Turk.]

Includes an account of the station which opened near Istanbul in 1951 with German equipment. Planned by the Faculty of Foresty, Istanbul University, it is run by the Forest Service in collaboration with the Silvicultural Section of the Faculty .

917. MÉTRO, A. La recherche forestière au Maroc. **[Forest research in Morocco.]** *Rev. for. franç.* 1952 (6), (408–18 + 3 photos). [F.]

Gives an account of the Forest Research Station at Rabat and the principal lines of research being pursued there.

918. STOFFELS, E. Het landbouwkundig onderzoek in Belgisch Congo. **[Agricultural research in the Belgian Congo.]** *Landbouwk. Tijdschr.* 64 (5), 1952 (298–303). [Du.f.] A.P.B.

An account of research work by INÉAC, including forest research at the Yangambi and Luki stations.

919. **East African Agriculture and Forestry Research Organization Annual Report 1951.** East Africa High Commission, Nairobi. [1952]. pp. 88.

Includes an account of the removal from Amani and the new quarters of EAAFRO at Kikuyu, with a brief review of current research.

920. **The Manitou Experimental Forest: its work and aims.** *Sta. Pap. Rocky Mt. For. Range Exp. Sta.* No. 7, 1952. pp. 23.

An illustrated account of subjects studied, under the heads: range management, artificial revegetation and watershed management.

921. **The Fraser Experimental Forest: its work and aims.** *Sta. Pap. Rocky Mt. For. Range Exp. Sta.* No. 8, 1952. pp. 27.

An illustrated account of subjects studied, under the heads: forest management and watershed management.

946.2. *Conferences and Excursions*

922. **Proceedings of the Pakistan Forestry Conference held in Karachi on the 1st and 2nd July, 1949.** Ministry of Food and Agriculture, Karachi. 1950. pp. 66.

95. FOREST TAXATION

923. HEERMANCE, E. L. **Woodland taxation [in Connecticut].** *Repr.* from *Connecticut Woodlands, New Haven* July, 1952. pp. 2.

924. HAMMERLE, W. C.; WYATT, W. W.; STAEBNER, R. C. **Special tax edition.** *For. Fmr.* 11 (9), 1952 (7–9, 12–8).

Contains the following articles: We need a better tax system (*W. C. Hammerle*); What records do landowners need to keep for tax purposes (*W. W. Wyatt*); Timberland taxation in operation (*R. C. Staebner*).

96. FOREST LABOUR QUESTIONS, LABOUR QUESTIONS IN WOOD TRANSPORT AND THE WOOD INDUSTRIES

See also No. 373.

925. SWAN, H.; ANNELL, K.-A.; TILLANDER, T.; WINROTH, C. Arbetskraftsfrågor inom skogsbruket. **[Forestry labour problems.]** *Svenska SkogsvFören. Tidskr.* 50 (2), 1952 (137–67). [Sw.]

A discussion which includes figures showing the comparative time spent on the different jobs in felling and preliminary conversion, production by horse- and tractor-hauling, time spent on different work in regeneration, wages in felling, pulping and sawmilling, wages in Sweden, Finland, U.S.A., and Canada, the number and ages of forestry workers from 1937 to 1952, and employment rates during winter and summer.

926. SAMBERGS, Å. Skogsarbetarnas löner åren 1913/14–1951/52. **[Wages of forest workers [in Sweden] for the years 1913/14 to 1951/52.]** *Skogsägaren* 28 (6), 1952 (114–9). [Sw.]

97. INTERNATIONAL FOREST POLICY AND OTHER INTERNATIONAL COLLABORATION

971. *Congresses, Conferences*

See also Nos. 815–6, 885.

927. STANER, P. Conférence forestière interafricaine d'Abidjan. **[The inter-African forestry conference at Abidjan.]** *Bull. agric. Congo belge* 43 (2), 1952 (481–96). [F.flem.]

Reproduces and discusses the recommendations made by the conference, held in December 1951 under the aegis of the committee for Technical Co-operation in Africa South of the Sahara. The general theme of the conference was the protection of African forests against man-made devastation.

972. *Organizations*

See also Nos. 810, 885.

928. HUBERMAN, M. A., and PURKAYASTHA, C. **The second year of FAO's work in forestry and forest products in Asia and the Pacific.** *Aust. For.* 15 (1), 1951 [1952] (3–8).

929. **International Chestnut Commission.** *Report of the 6th Session of the Conference of FAO, 19 November-6 December 1951*, 1952 (82). [E.F.Span.]

The Conference authorized the Director General to constitute an International Chestnut Commission with statutes similar to those of the International Poplar Commission.

References: 1. *Annual Report of the Forestry Commission of New South Wales, 1949/50*, Sydney; 2. *Colonial Research, 1951/52*, London; 3. *CPPA News Bulletin*, Montreal; 4. *FAO publication*, Rome; 5. *Forêt Conservation*, Quebec; 6. *Italia Agricola*, Rome; 7. *Journal of Forestry*, Washington; 8. *Naval Stores Review*, New Orleans; 9. *New Commonwealth*, London; 10. *Paper Trade Journal*, New York; 11. *Southern Lumberman*, Nashville, Tenn.; 12. *Timber Trades Journal*, London; 13. *Timberman*, Portland, Ore.; 14. *Unasylva*, Rome; 15. *Wood*, London.

FAO. Invitations have been issued for the first forestry conference under FAO sponsorship in the Near East, to be held at Amman, Kingdom of Jordan, 13–20 Dec. 1952. The provisional agenda includes statements by the various country delegations on their national forest policies and conservation, with special emphasis on the relationship of grazing to forestry, afforestation techniques and methods for nursery and planting operations, fixation of sand dunes, planting windbreaks, shelterbelts, village fuel areas, and Poplar cultivation. A similar conference for the Middle East is being held at Beirut, 8–16 Dec. (**4**; Nov. 1952).

The Forestry Division is preparing papers, based on replies from pulp and paper institutes in various parts of the world, on the standardization of methods of testing pulping qualities, and the recommended processes to be used for pulping all temperate and tropical wood species and non-wood raw materials, with special emphasis on agricultural residues. In response to requests received from member governments, survey teams consisting of a forester and a pulp and paper expert, have made, or are making, reconnaissance surveys in Cuba, Ecuador, Greece, Haiti, Mexico, Peru and Jugoslavia. Requests for such surveys have been received from 16 other countries and will be dealt with as soon as survey teams can be made available (**4**; Oct. 1952).

Preparations were complete for the initiation of a Mechanical Logging Centre in the Philippines on 1 Oct. 1952, with the participation of 38 men from Burma, Cambodia, China, Indonesia, Laos, Malaya, North Borneo, Philippines, Thailand, and Vietnam. The programme includes lectures at the university, but most of the 6-months course will take place in the field, in planning and lay-out of logging operations; use of power saws for felling; methods of skidding, loading, and hauling logs; operation and maintenance of equipment; location and surveying of extraction lines; construction of roads and railways (**4**; Oct. 1952).

Australia. It has been discovered that the bark of *Melaleuca leucadendron* contains a large proportion of cork and is therefore an excellent insulant when properly processed. Experiments have shown that flour produced from the bark can be substituted for cork in the manufacture of linoleum, and it is considered that this bark may become the basis of a substantial industry in New South Wales (**1**; 1952).

Austria. The Government has decided to devote the sum voted for timber research by the ECA mission to the establishment of a timber research institute at Vienna. Help is also being given by the Ministry of Commerce, the commune of Vienna and the Chambers of Commerce for Vienna and Lower Austria (**6**; June 1952).

Canada. Marathon Paper Mills of Canada Ltd. have established several forest villages or permanent camps in Ontario, where their forest workers can live a normal life with their families, instead of spending a large part of the year in seasonal camps. Increasing mechanization allows operations to be spread throughout the year, and sustained-yield management makes it possible to maintain a permanent labour force in one place. At Caramat, one of these settlements, the men work over a radius of 10–15 miles from the village and are transported to and from work by lorry over permanent forest roads (**5**; Nov. 1952).

A group of people at Kelowna, B.C., has been experimenting for some years with a method of producing pulp for cigarette papers from Apple tree prunings. Bark and wood of young growth (3 in. diameter and less) are used. The pulp is said to produce a better and finer paper with a better smoking flavour, at a lower cost, than the papers ordinarily used [cf. *For. Abstr.* 14 (No. 838)] (**10**; 22.8.52).

Ceylon. An FAO technical expert has toured the Province of Uva to examine the possibilities of mechanized afforestation of the extensive *patanas* (grasslands). Over 10,000 acres of wet and dry *patanas* are available and a start will probably be made with planting *Pinus caribaea* on about 1000

acres. In order to meet the urgent need for railway sleepers, the Forest Department is arranging to install a pressure-impregnation plant at Boossa in S. Ceylon where there is already a Government plywood factory. Hora [*Dipterocarpus zeylanicus?*] sleepers, pressure-impregnated, last 12–15 years, which is longer than the life of imported Douglas Fir sleepers (**9**; 1.9.52).

Great Britain. A striking example of the modern use of timber with a remarkable decorative effect is the adoption by the Sidmouth Urban District Council of Iroko (*Chlorophora excelsa*) wood for lamp standards on their esplanade. The standards, designed by the Council surveyor in collaboration with T.D.A., are 21 ft. high, tapering from 9 × 9 in. at the base to 6 × 6 in. at the top. They have a synthetic-resin finish (**15**; Sept. 1952).

During the relief work after the floods at Lynmouth, a type of portable timber road surface, the Sommerfeld Flexboard road, was used. Army units working at Lynmouth found that these roads can be laid or taken up easily and quickly. Being flexible, of timbers held together by steel bands, they make a firm roadway on bogged ground, and the heavier type will take vehicles with an axle load of up to 15 tons (**15**; Sept. 1952).

An all-timber storage shed designed for the Kilmarnock branch of Brownlee & Co. Ltd., timber importers and merchants, is the first of its type (a single-storey structure built entirely of timber and using joints made with bolts and toothed-plate timber connectors) to be tested for performance. The design is based on the T.D.A. industrial truss, modified to include knee bracing to give lateral stability. The timber used, from normal stocks of carcassing-quality European whitewoods, is equal in quality to that described as 800 lb. *f* grade in British Standard 940. All timber other than roof shingles and boarding was impregnated with Tanalith preservative. The structure withstood the tests, including a dead-load test and a stiffness test for wind-loading, both in accordance with the B.S. draft code of practice "The Structural use of Timber in Building" (**15**; Nov. 1952).

The City of Liverpool College of Technology has instituted a saw-doctor's course, at the request of various interested bodies, including the Crown Agents for the Colonies and the Saw Manufacturers' Association of Sheffield. This is the first course of the kind in Great Britain. Equipment is being installed and it is hoped that the first course will start in November (**15**; Oct. 1952).

New equipment for boring out and plugging knots in solid timber, for firms whose production does not justify the installation of a high-production machine, has been introduced on the British market by Interwood Ltd. of 326 Old Street, London, E.C.1. The DAB is a 3-spindle boring and plugging machine. The three tool spindles, which can be fitted with a boring bit or with a plug cutter, are driven by an electric motor through an endless belt. A plug press can be built on to the main machine in line with the tool spindles. When the boring bit has bored out the knot, the plug, already cut and dipped in cold glue, is fitted into the bored hole by the press (**15**; Nov. 1952).

The T.D.A. and the Association of British Plywood Manufacturers have produced some test specimens of plywood piping. The specification called for 16-ft. lengths with a nominal 6-in. bore and collars at each end so that the lengths could be connected by a special joint. They had to be strong, to withstand a test pressure of 150 lb./sq. in., to be light enough for a man to carry 2 lengths, and to have a good storage life. In the plywood specimens the collar was both glued and rivetted to the plywood tube and a pressure of 184 lb. was reached before failure. The tube itself showed no evidence of damage or potential failure after the test (**12**; 1.11.52).

Malaya. A new development in the jungle warfare is the destruction of roadside undergrowth where terrorists could hide in ambush. This is done by chemical spraying. Tanker lorries patrol the roads and experiments are also being made with aerial spraying (**9**; 1.9.52).

Mexico. An investigation of the high mortality rate of *Cedrela odorata* seedlings in Yucatan plantations showed that the primary cause was sun-scald followed by attack of the injured tissues by a buprestid beetle in association with an unidentified fungus. Many surviving trees in the area had old canker-like lesions on the lower part of the main stem, which had presumably originated in this way (**14**; Sept. 1952).

New Zealand. With the formation of the Tasman Pulp & Paper Company, the New Zealand Government has launched its long envisaged plan to establish a pulp and paper industry in the North Island. The new company, with a nominal capital of £6,000,000, includes 3 Government representatives and 3 representatives of the New Zealand company, Fletcher Holdings Ltd., and American associates. Additional capital will be raised outside New Zealand to ensure the implementation of the original plan to produce annually 70,000,000 bd. ft. of timber, 100,000 tons of newsprint, 10,000 tons of other printing and writing paper, and 15,000 tons of pulp (**9**; 21.7.52).

North Borneo. The herbarium at Sandakan, which was under the control of the North Borneo Forestry Department, was destroyed during the Japanese occupation. A Colonial Development and Welfare Research scheme proposes to meet in full the cost of re-establishing the herbarium and the appointment of a forest botanist, who would be considered as based on the Malayan Forestry Research Station, Kepong, but who would work for 3 or more years in the first instance from the herbarium at Sandakan (**2**; Sept. 1952).

A new source of wealth has been found in the swamp forests of Sarawak. An Australian company has shown that the wood of Ramin (*Gonystylus bancanus*), hitherto regarded as valueless, is eminently suitable for pulpwood and other uses. It has to be extracted from the swamps on light railways [cf. *For. Abstr.* 13 (No. 3888)] (**9**; 9.6.52).

Philippines. A modern forest products laboratory, modelled on the laboratory at Madison, is to be established at Los Banos, Laguna. Research subjects will include timber testing, wood technology, industrial investigations, insect and fungus control, forest products other than wood, and methods of manufacturing products from native woods, Rattan, Bamboo, gums and tannins. Facilities for studying pulp and paper, pressed board, plywood and veneers will be available to Philippine firms (**13**; Sept. 1952).

U.S.A. The Crossett Lumber Company and the Southern Lumber Company are co-operating with the Southern Forest Experiment Station, New Orleans, in financing fundamental research in forest soils and genetics. The two companies will contribute during the next 5 years a total of $45,000 towards the new projects. The object of the research in genetics is 'to develop strains of fast growing, high-quality, pest-resistant, and otherwise superior trees adapted to forest lands in Arkansas and other southern States'. The other study will be concerned with the physical, biological, and chemical properties of the forest soils in southern Arkansas and adjacent regions, the effects on soils of prescribed burning and various methods of forest management, and other factors affecting the productivity of forest soils (**7**; Sept. 1952).

A new forest insect laboratory has been opened at Liberty, Texas. This is a sub-station of the Forest Insect Investigations Laboratory of Gulfport, Miss., and was established largely through the efforts of the Texas Lumber Manufacturers Association. Operated by the Forest Insect Investigations Division of the U.S. Bureau of Entomology, it will be concerned with the study of forest insects in Arkansas, Louisiana, and Texas (**8**; 6.9.52).

A small packet of Pine seeds is to be issued with every hunting licence sold in Virginia, to aid in seed dissemination. The packets contain White, Loblolly, or Shortleaf Pine seeds and will be distributed to licence vendors so that each species will be dropped in areas best suited to it (**3**; Sept. 1952).

A U.S. patent has been granted for a 'device for setting and controlling backfires'. It is a unit designed for pulling behind a truck or other vehicle, and is capable of lighting and extinguishing backfires [counterfires] at speeds up to 8 miles (13 km.)/hr. in light fuels. The part of the unit that lights the fires resembles a flame-thrower. The other important component consists of a series of nozzles through which water is sprayed to put out the fire on the outside of the line. The backfire then eats back into the path of the main fire (**14**; Sept. 1952).

A new type of wooden minesweeper for the U.S. Navy is made by a process of laminating Oak and Fir planks under heat and pressure. Navy tests have shown that the strength of this laminated wood is equal to and often greater than steel. It has 3 times the strength of solid wood (**11**; 15.9.52).